The case study results can be analyzed and evaluated as follows:

(1) In all of the cases, the project cost per person becomes higher as the target coverage is raised.

(2) The upper limits of the planned target coverage for which the project can be completed feasibly within 5 years are 30% for Chuquisaca, 30% for the southern part of La Paz, 40% for Oruro, 50% for Tarija, and 40% for Santa Cruz. With higher targets, the extent of the project will be too great and will be difficult to realize in terms of funds, organization, technology, and time.

(3) For the case where the above target coverages are set, the minimum number of units of drilling equipment necessary for the completion of the project in 5 years will be 2 units for Chuquisaca, 1 unit for the southern part of La Paz, 1 unit for Oruro, 2 units for Tarija, and 3 units for Santa Cruz.

(4) A comparison of the project cost of each project implementation strategy shows that the project cost will be lowest with strategy [1] in most cases.

(5) A comparison of the case where foreign aid is restricted to drilling work (no provision of equipment) (form of project [B]) and the case where drilling equipment are provided by foreign aid and the Bolivian side carries out the drilling work (form of project [C]) shows that the total project cost will be lower for [B] in most cases. However, the difference is not significant and in terms of effective use of drilling equipment in the future, [C] is preferable as the project form.

5.4 Proposed Project

5.4.1 Selection of Blocks Targeted by the Plan

Upon analyzing the results of the project implementation case study, it was decided that a high priority should be placed on blocks with a high population and low present coverage. The blocks to be targeted by the plan were selected from among blocks with a present coverage of less than 30% and in the order starting from blocks of higher unserved population.

The selected blocks are shown in Tables 5-4-1 to 5-4-5. The number of blocks is 98 for Chuquisaca, 46 for the southern part of La Paz, 72 for Oruro, 85 for Tarija, and 155 for Santa Cruz or 456 in total. However, since this selection of blocks to be targeted by the plan is based on the water supply database and the intentions and willingness of the inhabitants to participate are not taken into consideration, a detailed field study should be carried out prior to starting the project for reevaluating, modifying, and finalizing the selection. Figures 5-4-1 to 5-4-5 show the locations of the selected blocks.

Table 5-4-1 List of Selected Blocks for the Department of Chuquisaca

Number	Block Number	Block Name	Population in 1994	W.Served Population in 1994	W.Served Ratio in 1994	Estimated Population in 2000	Expected Water Served Pop. in 2000	Expected Water Unserved Pop. in 2000	Estimated Well Depth (F-GW)	Geographical Region	Iod (l/pers.day)	Planned Water Supply Quantity (m3/day)	Stage Plan Year
a	b	c	d	e	f	g	h	i	j	k	l	m	n
101 Province OROPEZA													
1	101010120	UNALA	361	0	0%	434	0	434	B	b	70	30	3
2	101010203	SAN ANTONIO	641	0	0%	673	0	673	B	b	90	61	1
3	101010901	POTOLO	563	24	4%	525	22	503	A	b	90	47	3
4	101011301	MARAGUA	568	0	0%	687	0	687	A	b	90	62	1
5	101011405	CKOCHIS	451	100	22%	516	60	456	A	b	90	46	3
6	101011406	THACOS	432	0	0%	494	0	494	A	b	70	35	1
7	101020113	PANGORAHUASI	394	0	0%	416	0	416	B	b	70	29	3
8	101020201	HUAÑOMA H. BAJA	415	0	0%	426	0	426	A	b	70	30	1
		Total	3,845	124	3%	4,171	82	4,089				340	
102 Province AZURDUY													
9	102010305	RODEO GRANDE	293	0	0%	409	0	409	C	b	70	29	4
10	102010319	TABLA MAYU	361	0	0%	504	0	504	C	b	90	45	4
11	102010324	MOLLE MOLLE	356	0	0%	497	0	497	C	b	70	35	4
12	102010326	TABLANI	339	0	0%	473	0	473	C	b	70	33	4
13	102020102	CRUZ MAYU	387	0	0%	423	0	423	C	b	70	30	4
14	102020307	CAPAJTALA	473	0	0%	503	0	503	C	b	90	45	4
15	102020320	JOSE DE TROJE	524	0	0%	558	0	558	C	b	90	50	4
16	102020330	KOLLPA PAMPA	495	0	0%	527	0	527	C	b	90	47	4
		Total	3,228	0	0%	3,894	0	3,894				314	
103 Province ZUDAÑEZ													
17	103010102	HUANCARANI	429	0	0%	445	0	445	B	b	70	31	3
18	103010103	CAPILLA LLAVE	555	0	0%	575	0	575	B	b	90	52	3
19	103010121	SAYANCHACA	647	0	0%	671	0	671	C	b	90	60	3
20	103010122	MANDINGA	405	0	0%	420	0	420	C	b	70	29	3
21	103030102	REDENCION PAMPA	921	0	0%	975	0	975	C	b	90	88	1
22	103030106	YACAMBE	455	28	6%	482	23	459	C	b	70	34	3
23	103030115	EL POZO	483	0	0%	512	0	512	C	b	90	46	3
24	103030116	SAN JORGE	386	0	0%	409	0	409	B	b	70	29	3
25	103030131	QUIVALE	418	0	0%	443	0	443	B	b	70	31	3
26	103040118	JATUN MAYU	584	0	0%	635	0	635	C	b	90	57	3
27	103040125	CHAHUARANI	452	0	0%	492	0	492	C	b	70	34	3
28	103040126	ITHACO PAMPA	537	0	0%	584	0	584	C	b	90	53	3
		Total	6,272	28	0%	6,643	23	6,620				544	
104 Province TOMINA													
29	104010145	LAMPASILLOS	515	116	22%	565	90	475	D	b	90	51	5
30	104020107	THURUMAYU	415	0	0%	492	0	492	C	b	70	34	4
31	104020115	FUERTE RUA	447	0	0%	530	0	530	C	b	90	48	4
32	104020122	PAMPAS ABAJO	425	0	0%	503	0	503	D	b	90	45	5
33	104030102	MAMAHUASI	416	0	0%	424	0	424	C	b	70	30	5
34	104030104	AMANCAYA	441	0	0%	450	0	450	C	b	70	32	4
35	104030117	PAMPAS DEL CARMEN	601	0	0%	613	0	613	D	b	90	55	4
36	104060203	LA REVUELTA	386	0	0%	469	0	469	B	c	90	42	4
		Total	3,646	116	3%	4,046	90	3,956				337	
105 Province HERNANDO SILES													
37	105010105	CERRILLOS	554	143	26%	625	131	494	D	c	110	69	5
38	105010107	S. PEDRO DEL PARAPETI	428	56	13%	483	51	432	E	c	90	43	5
39	105010211	SAN JUAN DEL PIRAY AD	914	0	0%	890	0	890	D	c	110	98	2
40	105010305	PUCA MAYU	595	0	0%	613	0	613	B	c	110	67	2
41	105010329	VALLE NUEVO	982	200	20%	1,011	177	834	B	c	110	111	2
42	105020306	ATIRIMBA	409	0	0%	443	0	443	D	c	90	40	5
		Total	3,882	399	10%	4,065	359	3,706				429	
106 Province YAMPARAEZ													
43	106010124	SURIMA GRANDE	392	0	0%	430	0	430	B	b	70	30	3
44	106010172	CHOQUERI	386	0	0%	424	0	424	B	b	70	30	3
45	106010179	PAMPA LUPIARA	900	0	0%	988	0	988	C	b	90	89	1
46	106010189	JUCHU LUPIARA	504	136	27%	553	112	441	C	b	90	50	3
47	106020102	THOLA HUANCA	498	0	0%	503	0	503	A	b	90	45	1
48	106020136	PATA SAN JUAN	526	0	0%	531	0	531	B	b	90	48	3
49	106020143	COROMA	541	0	0%	546	0	546	B	b	90	49	3
		Total	3,747	136	4%	3,975	112	3,863				341	
107 Province NOR CINTI													
50	107010210	LADERAS	501	0	0%	493	0	493	A	b	70	35	1
51	107010505	QUISQUIRA	453	0	0%	522	0	522	A	b	90	47	1
52	107010705	PALQUI PAMPA	447	0	0%	506	0	506	A	b	90	46	1
53	107010801	CANTON MUYUQUIRI	1,338	252	19%	1,309	207	1,102	A	b	90	118	2
54	107020108	YAPUSIRI	390	0	0%	459	0	459	C	b	70	32	4
55	107020109	RODEO CANCHA	407	0	0%	479	0	479	C	b	70	34	4
56	107020403	PAYACOTA DEL C. AD	804	0	0%	839	0	839	A	b	90	76	1
57	107020501	PIRHUANI	392	0	0%	409	0	409	C	b	70	29	4
58	107020504	CHUNCHO	399	0	0%	417	0	417	C	b	70	29	4
59	107020505	OJEDO	574	0	0%	599	0	599	C	b	90	54	2
60	107020506	SACAWILLQUE	1,162	0	0%	1,213	0	1,213	C	b	90	109	1
61	107020605	TOKHO KHASA	444	0	0%	455	0	455	C	b	70	32	4
62	107020710	LAJA KHASA	556	0	0%	569	0	569	A	b	90	51	1
63	107020711	KHOCHA PATA	930	52	6%	953	44	909	A	b	90	86	2

Table 5-4-1 List of Selected Blocks for the Department of Chuquisaca

Number	Block Number	Block Name	Population in 1994	W.Served Population in 1994	W.Served Ratio in 1994	Estimated Population in 2000	Expected Water Served Pop. in 2000	Expected Water Unserved Pop. in 2000	Estimated Well Depth (F-GW)	Geographical Region	lcd (l/pers.day)	Planned Water Supply Quantity (m3/day)	Stage Plan Year
64	107020712	OCURICUCHO	986	0	0%	1,010	0	1,010	A	b	90	91	1
65	107020802	PASLA	438	0	0%	457	0	457	C	b	70	32	4
66	107030103	PALCA PATA	777	96	12%	855	70	785	A	b	90	77	2
67	107030104	ALPAJA ALTA	918	152	17%	1,010	135	875	A	b	90	91	2
68	107030105	HUANCARANI BAJO	707	100	14%	778	90	688	A	b	90	70	2
69	107030107	CHUNCHULI	969	172	18%	1,066	153	913	A	b	90	96	2
70	107030109	JOLENCIA	923	52	6%	1,015	42	973	A	b	90	91	2
71	107030111	PUEBLO ALTO	422	0	0%	464	0	464	A	b	70	32	1
72	107030112	SULTACA BAJA	746	80	11%	821	71	750	A	b	90	74	2
73	107030113	SULTACA ALTA	480	16	3%	528	16	512	A	b	90	48	2
74	107030114	ALPAJA BAJA	818	32	4%	900	23	877	A	b	90	81	2
75	107030201	PUCARA DE YATINA	730	0	0%	762	0	762	A	b	90	69	1
76	107030202	TAPENTACA	407	0	0%	425	0	425	A	b	70	30	1
77	107030308	SACANI	438	0	0%	457	0	457	A	b	70	32	1
78	107030402	EL FUERTE	541	0	0%	606	0	606	C	b	90	55	2
79	107030403	QUEMADA	634	16	3%	710	10	700	A	b	90	64	2
80	107030405	LAMPASAR	454	0	0%	508	0	508	C	b	90	46	2
81	107030501	LA BOMBONA	485	0	0%	506	0	506	A	b	90	46	1
		Total	20,675	1,019	5%	22,100	860	21,240				1,899	
108 Province BELISARIO BOETO													
82	108010210	MONTE GRANDE	418	0	0%	434	0	434	C	b	70	30	4
		Total	418	0	0%	434	0	434				30	
109 Province SUD CINTI													
83	109020102	CHARCOMA	401	0	0%	451	0	451	A	b	70	32	2
84	109020103	TODOSA	397	0	0%	447	0	447	A	b	70	31	2
85	109020104	YAQUINA BAJA/ALTA	418	20	5%	471	11	460	A	b	70	33	2
86	109020106	EL TOLAR	863	0	0%	971	0	971	A	b	90	87	2
87	109020107	LA BANDA	657	0	0%	740	0	740	A	b	90	67	2
88	109020115	SAN LORENZO	521	0	0%	586	0	586	A	b	90	53	2
89	109020118	CENTRO	617	0	0%	694	0	694	A	b	90	62	2
90	109020301	EL PALMAR	656	0	0%	635	0	635	C	b	90	57	2
91	109020502	EL MONTE	433	0	0%	419	0	419	A	b	70	29	2
92	109020602	SALVIANI	400	0	0%	428	0	428	A	b	70	30	2
93	109020603	PUCA PAMPA AD	390	0	0%	417	0	417	A	b	70	29	2
		Total	5,753	20	0%	6,259	11	6,248				511	
110 Province LUIS CALVO													
94	110010204	CARATINDI	452	0	0%	472	0	472	E	c	90	42	5
95	110010405	EL MESON	430	0	0%	506	0	506	D	c	110	56	5
96	110030402	IPATI	405	0	0%	1,331	0	1,331	F	c	110	146	5
97	110030405	HACIENDA SIN NOMBRE	135	0	0%	444	0	444	F	c	90	40	5
98	110030501	ÑANCORAINZA	472	0	0%	493	0	493	F	c	90	44	5
		Total	1,894	0	0%	3,246	0	3,246				329	
		Grand Total	53,360	1,841	3%	58,833	1,538	57,295				5,073	

Table 5-4-2 List of Selected Blocks for the Southern Part of La Paz

Number	BNum	Nombre Bloque	Population in 1994	W.Served Population in 1994	W.Served Ratio in 1994	Estimated Population in 2000	Expected Water Served Pop. in 2000	Expected Water Unserved Pop. in 2000	Estimated Well Depth (F-GW)	Geographical Region	lcd (l/pers.day)	Planned Water Supply Quantity (m3/day)	Stage Plan Year
a	b	c	d	e	f	g	h	i	j			k	l
203 Province PACAJES													
1	203000502	Jankho Khalani	404	0	0%	365	0	365	D	a	50	18	5
2	203001101	Huaylapanta	376	0	0%	343	0	343	D	a	50	17	5
3	203002402	Zona Poke	363	0	0%	328	0	328	D	a	50	16	5
4	203002403	Tejpuna Centro	358	0	0%	324	0	324	D	a	50	16	5
5	203002404	Tejpuna Centro B	980	0	0%	882	0	882	D	a	70	62	4
6	203002406	Villa Viluyo B	450	0	0%	405	0	405	D	a	50	20	4
7	203002703	Cmd. Acero Marca II	430	0	0%	387	0	387	C	a	50	19	3
8	203002801	Cmd. Villa Anta	625	0	0%	565	0	565	C	a	70	40	2
9	203004715	Kella Kella Alta	314	0	0%	284	0	284	C	a	50	14	4
10	203005401	Cmd. Phina	341	0	0%	308	0	308	C	a	50	15	4
11	203005501	Charana	1,125	104	9%	1,017	62	954	C	a	70	71	2
12	203005901	Ladislao Cabrera	350	0	0%	316	0	316	C	a	50	16	3
13	203006301	Canuta	368	0	0%	333	0	333	C	a	50	17	3
		Total	6,486	104	2%	5,857	62	5,795		0	710	342	
213 Province AROMA													
14	213000402	Cmd Chuacolla Grande	348	0	0%	347	0	347	A	a	50	17	1
15	213000502	Chica Belen	421	108	26%	420	99	321	A	a	50	21	2
16	213000601	Cala Cala	874	220	25%	872	132	740	A	a	70	61	2
17	213000602	Conani	550	8	1%	549	7	542	A	a	70	38	2
18	213000603	Huana Kollo	401	18	4%	400	0	400	A	a	50	20	2
19	213000606	Vilaque	314	0	0%	313	0	313	A	a	50	16	2
20	213000607	Catavi	307	0	0%	306	0	306	A	a	50	15	2
21	213000608	Taruca	299	0	0%	298	0	298	C	a	50	15	4
22	213000801	Panduro	421	0	0%	420	0	420	A	a	50	21	1
23	213001106	Machacamarca	300	0	0%	299	0	299	C	a	50	15	4
24	213001202	Tolerani	296	0	0%	295	0	295	D	a	50	15	5
25	213002002	Quilloma Yanamuyo	385	44	11%	400	41	359	A	a	50	20	2
26	213002301	Coltana Tolar	376	0	0%	322	0	322	A	a	50	16	2
27	213002302	Jara Kollu	316	0	0%	315	0	315	A	a	50	16	2
28	213002401	Ecia. Chicanchata	269	0	0%	268	0	268	D	a	50	14	5
29	213002601	Cmd. Cañuma Pampa	416	0	0%	415	0	415	C	a	50	21	3
30	213002702	Ecia. Panzuri	275	0	0%	274	0	274	C	a	50	14	4
31	213002901	Ecia. Cusmini	340	0	0%	339	0	339	C	a	50	17	3
32	213003001	Ecia. Chocorosi	696	0	0%	694	0	694	A	a	70	49	1
33	213003002	Ecia. caluyo	658	0	0%	656	0	656	A	a	70	46	1
34	213003003	Ecia. Choritotora	458	0	0%	457	0	457	A	a	50	23	1
35	213003402	Cauchi Titiri	472	0	0%	471	0	471	C	a	50	24	3
36	213003403	Arajllanga	470	0	0%	469	0	469	C	a	50	23	3
37	213003404	Taipillanga Sud	437	0	0%	436	0	436	C	a	50	22	3
38	213003410	Tarumaya	271	0	0%	270	0	270	C	a	50	14	4
39	213003602	Jisuhakhoilo	387	0	0%	386	0	386	A	a	50	19	1
40	213003701	Montecani	310	0	0%	309	0	309	C	a	50	15	3
41	213004401	Viscachani	206	0	0%	316	0	316	A	a	50	16	2
42	213004402	Ecia. Aroma	287	0	0%	286	0	286	A	a	50	14	2
43	213004502	Viluyo	391	0	0%	390	0	390	D	a	50	20	5
44	213005202	Machacamarca	1,049	0	0%	1,046	0	1,046	C	a	70	73	1
45	213005301	S. de Llallagua	1,500	217	17%	1,297	188	1,109	C	a	70	91	2
46	213005801	Hichuraya Chico	271	0	0%	270	0	270	C	a	50	14	4
		Total	14,591	614	4%	14,628	469	14,159		0	1,770	834	
		Grand Total	21,077	718	3%	20,485	528	19,957		0	3,440	1,176	

Table 5-4-3 List of Selected Blocks for the Department of Oruro

Number	Block Number	Block Name	Population in 1994	W. Served Population in 1994	W. Served Ratio in 1994	Estimated Population in 2000	Expected Water Served Pop. in 2000	Expected Water Unserved Pop. in 2000	Estimated Well Depth (F-GW)	Geographical Region	lcd (l/pers.day)	Planned Water Supply Quantity (m3/day)	Stage Plan Year
a	b	c	d	e	f	g	h	i	j			k	l
401 Province CERCADO													
1	401000107	Ventilla Umani	234	0	0%	236	0	236	B	a	50	12	1
2	401000302	Cala Cala	1,413	218	15%	1,454	131	1,323	C	a	70	102	3
3	401000401	Paria	230	0	0%	232	0	232	C	a	50	12	4
4	401000402	Soracachi	422	0	0%	426	0	426	C	a	50	21	3
5	401000403	Anocariri	247	0	0%	249	0	249	C	a	50	12	4
6	401000404	Obrajes	250	15	6%	253	0	253	C	a	50	13	4
7	401000405	San Juan Pampa	550	0	0%	556	0	556	C	a	70	39	3
8	401000407	Canllapampa	280	0	0%	283	0	283	C	a	50	14	3
9	401000409	Cala Pata	347	0	0%	350	0	350	C	a	50	18	3
10	401000410	Ocotavi	239	0	0%	241	0	241	C	a	50	12	4
11	401000412	Jachuma	462	0	0%	467	0	467	C	a	50	23	3
12	401000413	Iruma	438	0	0%	442	0	442	C	a	50	22	3
13	401000420	Condor Chinoca	365	6	2%	369	0	369	C	a	50	18	3
14	401000424	Jachuyo	300	0	0%	303	0	303	C	a	50	15	3
15	401001002	Cohani	430	0	0%	434	0	434	C	a	50	22	3
16	401001102	Jankho Nuño	355	0	0%	359	0	359	B	a	50	18	1
17	401001201	Choro	320	0	0%	323	0	323	B	a	50	16	1
18	401001301	Challacollo	1,500	0	0%	1,544	0	1,544	B	a	70	108	1
19	401001802	Chillka	603	0	0%	609	0	609	C	a	70	43	1
20	401001805	Thola Palca Chico	2,230	0	0%	2,295	0	2,295	C	a	80	184	1
21	401001806	Huayllatira	251	0	0%	254	0	254	C	a	50	13	4
		Total	11,466	239	2%	11,679	131	11,548				736	
402 Province CHALLAPATA O AVAROA													
22	402000601	Cruce Culta	320	15	5%	323	0	323	C	a	50	16	2
		Total	320	15	5%	323	0	323				16	
403 Province CARANGAS													
23	403000107	Jhanko khala	250	0	0%	253	0	253	B	a	50	13	2
24	403000201	San antonio de Nor Cala	300	6	2%	303	0	303	D	a	50	15	5
25	403000301	San Jose de Kala	254	5	2%	257	4	253	E	a	50	13	5
26	403000801	Opoqueri	236	0	0%	238	0	238	E	a	50	12	5
27	403001501	San pedro de Huaylloco	385	78	20%	389	47	342	D	a	50	19	4
28	403002201	Villa Turucachi	272	0	0%	275	0	275	B	a	50	14	2
29	403002301	Choquecota	381	19	5%	385	12	373	B	a	50	19	2
		Total	2,078	108	5%	2,100	62	2,038				106	
404 Province SAJAMA													
30	404000201	Sajama	490	18	4%	495	16	479	C	a	50	25	3
31	404000504	Ecia. Titiri	300	0	0%	303	0	303	B	a	50	15	1
32	404000703	Ecia. Pampa Magachi	478	137	29%	483	82	401	C	a	50	24	3
		Total	1,268	154	12%	1,281	98	1,183				64	
405 Province LITORAL													
33	405000306	Huachacalla	983	278	28%	993	0	993	B	a	70	70	2
		Total	983	278	28%	993	0	993				70	
406 Province POOPO													
34	406000201	Venta y Media	300	7	2%	303	5	298	C	a	50	15	4
35	406000207	Ecia. Carajara	356	0	0%	360	0	360	C	a	50	18	1
36	406000701	Peñas	1,000	161	16%	1,010	104	906	C	a	70	71	2
37	406000801	Totoral	1,197	84	7%	1,232	54	1,178	B	a	70	86	2
38	406000804	Campamento Colon	230	0	0%	232	0	232	B	a	50	12	1
39	406001001	Urmiri	366	96	26%	370	66	304	C	a	50	19	4
		Total	3,449	347	10%	3,507	229	3,278				220	
407 Province PANTALEON DALENCE													
40	407000106	Ecia. HullaTiri	249	0	0%	251	0	251	C	a	50	13	4
41	407000206	Campamento Florida	229	0	0%	231	0	231	D	a	50	12	4
42	407000207	Ecia. Paco Pampa	280	0	0%	283	0	283	C	a	50	14	4
		Total	758	0	0%	765	0	765				38	
408 Province LADISLAO CABRERA													
43	408000101	Salinas de Garci Mendoza	405	97	24%	409	0	409	A	a	50	20	2
44	408000105	Lia	250	0	0%	253	0	253	A	a	50	13	2
45	408000108	Tauca	380	0	0%	384	0	384	B	a	50	19	2
46	408000116	Caltahaltka	315	0	0%	318	0	318	C	a	50	16	3
47	408000201	Chalacota	234	6	3%	236	0	236	E	a	50	12	5
48	408000401	Jirira	258	0	0%	261	0	261	B	a	50	13	2
49	408000501	Ucumasi	323	90	28%	326	72	254	E	a	50	16	5
50	408000804	Kañavicola	300	0	0%	303	0	303	C	a	50	15	3
51	408001101	Pampa Ullagas	464	2	0%	469	2	467	B	a	50	23	2
52	408001106	Huayllas	236	0	0%	238	0	238	B	a	50	12	2
		Total	3,165	195	6%	3,197	74	3,123				160	
409 Province ATAHUALLPA													
53	409000101	Sabaya	260	4	2%	263	0	263	A	a	50	13	2
54	409002301	Coipasa	314	0	0%	317	0	317	C	a	50	16	3
55	409002601	Ayparavi	240	0	0%	242	0	242	E	a	50	12	5
		Total	814	4	1%	822	0	822				41	
410 Province SAUCARI													
56	410000101	Toledo	757	0	0%	765	0	765	C	a	70	54	1
57	410000701	Catuyo	235	0	0%	237	0	237	C	a	50	12	3

Table 5-4-3 List of Selected Blocks for the Department of Oruro

Number	Block Number	Block Name	Population in 1994	W.Served Population in 1994	W.Served Ratio in 1994	Estimated Population in 2000	Expected Water Served Pop. in 2000	Expected Water Unserved Pop. in 2000	Estimated Well Depth (F-GW)	Geographical Region	lcd (l/pers.day)	Planned Water Supply Quantity (m3/day)	Stage Plan Year
58	410001702	Alto Saucari	259	0	0%	262	0	262	B	a	50	13	1
		Total	1,251	0	0%	1,264	0	1,264				79	
411 Province TOMAS BARRON													
59	411000201	Quetcata	596	17	3%	602	0	602	B	a	70	42	1
		Total	596	17	3%	602	0	602				42	
412 Province SUD CARANGAS													
60	412000201	Orinoca	743	101	14%	750	81	669	C	a	70	53	2
61	412000301	Belen de Andamarca	269	2	1%	272	2	270	D	a	50	14	5
62	412000601	Real Machacamarca	284	0	0%	287	0	287	D	a	50	14	5
		Total	1,296	104	8%	1,309	83	1,226				80	
413 Province SAN PEDRO DE TOTORA													
63	413000109	Ecia. Hirpoyoco	360	55	15%	364	0	364	B	a	50	18	1
64	413000601	Calazaya	456	108	24%	461	0	461	B	a	50	23	1
65	413000701	Ecia. Concepcion Cuita	362	0	0%	366	0	366	B	a	50	18	1
		Total	1,178	163	14%	1,191	0	1,191				60	
414 Province SEBASTIAN PAGADOR													
66	414000701	Ecia. Wichaj Lupi	364	56	15%	368	48	320	B	a	50	18	2
67	414001301	Ecia. Castilluma	246	0	0%	248	0	248	C	a	50	12	4
68	414001701	Ecia. Guadalupe	322	0	0%	325	0	325	C	a	50	16	4
69	414002001	Santuario de Quillacas	374	63	17%	378	50	328	B	a	50	19	2
		Total	1,306	119	9%	1,319	99	1,220				66	
415 Province NOR CARANGAS													
70	416000101	Huayllamarca	267	49	18%	270	0	270	B	a	50	14	2
71	416000102	Chajña Uma	900	0	0%	909	0	909	B	a	70	64	1
72	416000112	Ecia. Chillcani	250	0	0%	253	0	253	B	a	50	13	2
		Total	1,417	49	3%	1,432	0	1,432				90	
		Grand Total	31,345	1,792	6%	31,784	775	31,009				1,867	

Table 5-4-4 List of Selected Blocks for the Department of Tarija

No.	Block Number	Block Name	Population in 1994	Water Served Population in 1994	Water Served Ration in 1994	Estimated Population in 2000	Expected W.Served Population in 2000	Unserved Population in 2000	Estimated Well Depth (F-GW)	Planned Water Supply Quantity (m3/day)	Stage Plan Year
a	b	c	d	e	f	g	h	i	j	k	l
601 Province CERCADO											
1	601010103	SELLA CANDELARIA RUNI CUACHA	449	0	0%	449	0	449	B	31	1
2	601010501	SANTA ANA NUEVA, SAN PEDRITO	961	173	18%	961	0	961	E	86	4
3	601010505	Santa Ana La Vieja y San Antonio	423	383	9%	478	0	478	B	33	3
4	601010602	TOLOMOSA GRANDE (ZONAS 1,2,3,4,5)	518	219	58%	525	219	306	D	47	3
5	601010705	YESERA SUD HORNOS LAJAS EL MONT	587	158	27%	633	151	482	C	57	3
6	601010802	SAN AGUSTIN SUD	318	0	0%	353	0	353	B	25	1
7	601011804	PAPA CHACRA	299	0	0%	299	0	299	B	21	3
8	601012001	CMD. BELLA VISTA (ZONAS 1,2,3)	672	0	0%	752	0	752	C	68	1
9	601012401	TURUMAYO (ZONA 1,2)	586	53	9%	658	0	658	C	59	3
10	601012501	SAN JACINTO SUD	283	0	0%	319	0	319	C	22	3
11	601012801	CHURQUIS	504	76	15%	504	76	428	C	45	3
		Total	5,600	1,062	19%	5,931	446	5,485		496	
602 Province ARCE											
12	602010201	Cmd. Colpana y Zona Centro	669	669	0%	669	0	669	C	60	2
13	602010203	CMD. CANCHAS MAYU	433	4	1%	622	0	622	C	56	2
14	602010506	ALIZOS DEL CARMEN	280	0	0%	377	0	377	C	26	4
15	602010801	ZONA CABILDO	362	0	0%	362	0	362	B	25	2
16	602010901	LOC. TACUARA	407	0	0%	463	0	463	C	32	2
17	602011001	CMD. GARRAPATAS	253	0	0%	274	0	274	B	19	4
18	602011101	CMD. SAN JOSE	350	0	0%	390	0	390	C	27	4
19	602011202	LOC. QUEBRADA DE CANAS	335	0	0%	335	0	335	B	23	2
20	602021802	Cmd. El Chorro	286	286	0%	219	35	184	D	15	4
21	602022101	Cmd. Talita	289	289	0%	235	0	235	C	16	4
22	602022102	LOC. PORCELANA BORDO	470	75	16%	577	68	509	E	52	4
23	602022103	LOC. PORCELANA BAJO	831	125	15%	1,018	114	904	E	92	2
24	602022104	LOC. CAMPO GRANDE	1,188	0	0%	1,453	0	1,453	E	131	2
25	602022105	LOC. NARANJITOS	389	0	0%	477	0	477	E	33	4
26	602022204	LOC. ARROZALES	369	0	0%	369	0	369	C	26	4
27	602022802	CMD. TREMENTINAL	468	468	0%	713	0	713	B	64	2
		Total	7,379	1,916	26%	8,553	217	8,336		700	
603 Province GRAN CHACO											
28	603010304	CMD. BUSUY CMD. TIMBOY	340	333	2%	273	0	273	C	19	5
29	603010305	CMD. SAIBALITO ECTAS SIMBOLAR	220	0	0%	274	0	274	E	19	5
30	603021501	CMD. SANTA ROSA	286	0	0%	320	0	320	C	22	5
31	603021602	URENDA CHINCHILLA BERETI	320	317	1%	299	0	299	C	21	5
32	603021704	CMD. NANCAHUAZU ASTILLERO	360	0	0%	365	0	365	C	26	5
33	603021905	CMD. SIORAS LECHERONAL	226	0	0%	264	0	264	C	18	5
34	603022001	CMD. FUERTE VIEJO	373	0	0%	400	0	400	D	28	5
35	603022101	CMD. CAMPO LARGO LAS TIPAS	475	461	3%	398	0	398	D	28	5
36	603022502	QUEBRACHAL SIMLOBAR ALGARROBAL	328	321	2%	281	0	281	D	25	5
37	603032801	CMD. PUESTO CHICO	344	0	0%	459	0	459	E	32	5
38	603033201	LOC. COTOTO-IGOPETY	211	0	0%	346	0	346	E	24	5
39	603033602	MISION MATACOS YUCHAN CMD. CREV	654	131	20%	695	115	580	E	76	5
40	603033603	ECIA. LA ENVIDIA BAJADA TUSCA CAMI	413	326	21%	388	0	388	D	35	5
41	603034004	LOC. IGUIRARO LAGUNITAS IGUEMBE	608	365	40%	416	0	416	D	29	5
42	603034301	CHIMEI	256	56	22%	532	54	478	E	48	5
		Total	5,414	2,310	43%	5,710	169	5,541		452	
604 Province AVILEZ											
43	604010401	COLON NORTE	300		3%	300	0	300	C	21	4
44	604010403	LAS BARRANCAS	270	0	0%	448	0	448	C	31	2
45	604010404	GUARANGUAY NORTE (MONTES MONT	217	0	0%	329	0	329	B	23	2
46	604010405	GUARANGUAY SUD	208	0	0%	374	0	374	B	26	1
47	604010801	RUJERO	424	8	2%	544	7	537	C	49	2
48	604022501	CAMPO ANTIGAL	254	0	0%	290	0	290	B	20	2
49	604022502	ALIZOS	349	0	0%	398	0	398	B	28	1
50	604022601	VIZCARRA	239		0%	239	0	239	B	17	2
51	604023402	CALDERAS CENTRO TRANCAS	273	0	0%	280	0	280	B	20	2
		Total	2,534	8	0%	3,202	7	3,195		235	
605 Province MENDEZ											
52	605010203	CMD. ALTO CAJAS	260	0	0%	307	0	307	B	21	2
53	605010302	COMARCA CHAMATA	94		0%	420	0	420	C	29	2
54	605010701	CMD. SAN PEDRO DE LAS PENAS	333	0	0%	333	0	333	B	23	2
55	605010903	CMD. CHAUPICANCHA	267	0	0%	288	0	288	C	20	4
56	605010904	CMD. SELLA LAS QUEBRADAS	227		83%	214	0	214	B	15	4
57	605010907	CMD. MONTE MENDEZ	286	0	0%	308	0	308	E	22	4
58	605011407	CMD. EL ROSAL	411		5%	325	0	325	B	23	2
59	605012201	CMD. SANTA BARBARA	280	0	0%	329	0	329	C	23	4
60	605012202	CMD. JARCA CANCHA	260	0	0%	305	0	305	B	21	2
61	605023011	CMD. SAN ROQUE	246		0%	200	0	200	B	14	4
62	605023013	SANTA ANA DE AGUA RICA	254	0	0%	303	0	303	C	21	4
		Total	2,926	0	0%	3,332	0	3,332		233	

Table 5-4-4 List of Selected Blocks for the Department of Tarija

No.	Block Number	Block Name	Population in 1994	Water Served Population in 1994	Water Served Ration in 1994	Estimated Population in 2000	Expected W.Served Population in 2000	Unserved Population in 2000	Estimated Well Depth (F-GW)	Planned Water Supply Quantity (m3/day)	Stage Plan Year
606 Province BURNET O' CONNOR											
63	606010201	CMD. HUAYCO CENTRO	345	10	3%	345	0	345	B	24	3
64	606010803	LOC. SAN DIEGO CENTRO	373	0	0%	403	0	403	B	28	1
65	606010901	CANTON CHIQUIACA	774	0	0%	995	0	995	C	90	1
66	606010901	CANTON CHIQUIACA	995	0	0%	995	0	995	C	90	1
67	606010902	LOC. LOMA ALTA	230	0	0%	297	0	297	B	21	3
68	606011002	SALINAS	273	0	0%	273	0	273	B	19	3
69	606011201	ECIA. MACHIGUA	224	0	0%	303	0	303	B	21	3
70	606011204	ECIA. AGUA BUENA	200	0	0%	271	0	271	B	19	3
71	606011205	TIMBOY	394	12	3%	394	0	394	B	28	1
72	606011206	ECIA. NAURENDA	243	0	0%	328	0	328	B	23	3
73	606011403	ZONA ALTO SAN JOSE	250	0	0%	273	0	273	B	19	3
74	606011404	SAN JOSECITO CENTRO	279	0	0%	305	0	305	B	21	3
75	606011405	ZONA CALDERILLA	340	0	0%	371	0	371	B	26	1
76	606011406	ZONA LA REA	306	0	0%	334	0	334	B	23	1
77	606011407	ECIA. ROSARIO	273	0	0%	298	0	298	B	21	3
78	606011601	CMD. NARANJOS	482	0	0%	644	0	644	B	58	1
79	606012001	CMD. VALLE DEL MEDIO	308	12	4%	308	0	308	B	22	3
80	606012201	CMD. PENA NEGRA	301	0	0%	310	0	310	B	22	3
81	606012601	ECIA. LAS TRAMPAS	356	0	0%	389	0	389	B	27	1
82	606012702	SUPITIN	322	0	0%	362	0	362	B	25	1
83	606013601	CMD. LIMAL	262	0	0%	262	0	262	B	18	3
84	606013602	LOC. SERERE SUD	313	0	0%	313	0	313	B	22	3
85	606013801	ECIA. GUARIPITINAL	427	0	0%	466	0	466	C	33	3
		Total	8,270	34	0%	9,239	0	9,239		699	
		Grand Total	32,123	5,330	17%	35,967	839	35,128		2,815	

Table 5-4-5 List of Selected Blocks for the Department of Santa Cruz

No.	Block Number	Block Name	Population in 1994	W.Served Population in 1994	W.Served Ratio in 1994	Estimated Population in 2000	Expected Water Served Pop.in 2000	Expected Water Unserved Pop.in 2000	Estimated Well Depth (F-GW)	Planned Water Supply Quantity (m3/day)	Stage Plan Year
a	b	c	d	e	f	g	h	i	j	k	l
701 Province ANDRES IBANEZ											
1	701010208	CMD. CLARA SERRANO....	487	0	0%	738	0	738	C	81	1
2	701010210	CMD. MAPAISO DE LAS PI	575	145	25%	871	0	871	B	96	3
3	701010212	COL. MENONITA CHOROVI.	458	0	0%	694	0	694	B	76	1
4	701010214	ECIA. STA. BARBARA....	320	0	0%	485	0	485	B	44	1
5	701010215	CMD. ITAPAQUI.....	323	0	0%	489	0	489	C	44	4
6	701010217	ECIA. LOS CHACOS.....	377	0	0%	570	0	570	C	63	3
7	701010221	CMD. EL TAROPE.....	528	45	9%	799	0	799	C	88	3
8	701010222	CMD. LA CRUCENA.....	355	0	0%	538	0	538	C	59	3
9	701010225	EL PARAISO DE LA SACAC	311	0	0%	470	0	470	C	42	4
10	701010226	CMD. CALLEJAS.....	509	0	0%	770	0	770	C	85	1
11	701010313	VILLA FLOR.....	525	0	0%	794	0	794	B	87	1
12	701010403	HDA. EL DORADO.....	647	0	0%	979	0	979	B	108	1
13	701010505	CMD. LOS CUCHISAS.....	450	0	0%	683	0	683	C	75	3
14	701010509	CAMPOS 72-73.....	401	0	0%	606	0	606	B	67	1
15	701010512	CAMPOS 77-80-84-86-81.	314	0	0%	476	0	476	B	43	3
16	701020102	CMD. LOMAS URUBO.....	341	91	27%	516	0	516	C	57	3
17	701020104	ECIA. LOS OJOS.....	312	0	0%	472	0	472	C	42	4
18	701020105	ECIA. GUAPURUSITO.....	332	87	26%	503	0	503	C	55	3
19	701020206	CMD. CHACO GUEMBE.....	325	0	0%	492	0	492	C	44	4
20	701020213	SIND. SANTA FE.....	446	0	0%	674	0	674	C	74	3
21	701030115	QUEBRADA LEON.....	344	0	0%	519	0	519	b	57	1
22	701030116	EL PLAYON.....	355	0	0%	538	0	538	b	59	1
23	701030124	ECIA. KM 12 - VILLA SI	549	0	0%	831	0	831	b	91	1
24	701030126	VILLA ROSARIO.....	315	0	0%	477	0	477	b	43	1
25	701030127	CMD. RANCHO CHICO.....	444	0	0%	672	0	672	b	74	1
26	701030130	CMD. SAN CARLOS.....	381	0	0%	576	0	576	b	63	1
27	701030131	CMD. LA MELEA.....	311	0	0%	470	0	470	b	42	3
28	701030133	VILLA BARRIENTOS.....	440	0	0%	666	0	666	b	73	1
29	701030136	CMD. VILLA TUNAVI.....	368	0	0%	557	0	557	b	61	1
30	701030139	TIKIPAYA.....	849	0	0%	1,286	0	1,286	b	141	1
31	701030141	ECIA. QUEBRADA - VILLA	418	0	0%	633	0	633	b	70	1
32	701030142	PARABANO.....	428	0	0%	647	0	647	b	71	1
33	701030146	EL SALAO.....	346	0	0%	523	0	523	b	58	1
34	701030148	ELVIRA.....	344	0	0%	519	0	519	b	57	1
35	701030502	LOS AGUAISES.....	378	0	0%	571	0	571	d	63	5
36	701030503	ECIA. NARANJILLOS.....	359	0	0%	544	0	544	d	60	5
37	701030504	CMD. MONTE GRANDE.....	332	0	0%	503	0	503	d	55	5
38	701030506	CMD. SAN MIGUEL DEL RO	548	0	0%	830	0	830	d	91	5
39	701030510	CMD. BASILIO.....	732	0	0%	1,108	0	1,108	d	122	5
40	701030512	CMD. CANAVERAL.....	720	0	0%	1,090	0	1,090	d	120	5
		Total	17,297	368	2%	26,179	0	26,179		2,803	
702 Province WARNES											
41	702010102	STA.ROSITA.....	536	103	19%	596	0	596	B	66	2
42	702010202	AZUSAQUI.....	453	119	26%	503	0	503	B	55	2
43	702010203	HDA. LA CUTA.....	517	0	0%	575	0	575	B	63	2
44	702010206	NARANJAL DON BOSCO....	478	0	0%	531	0	531	B	58	2
45	702010634	ECIA. SAN ANCELMO....	450	0	0%	500	0	500	B	45	2
46	702010638	COL. MONTE CRISTO....	477	0	0%	530	0	530	B	58	2
		Total	2,911	222	8%	3,235	0	3,235		346	
703 Province VELASCO											
47	703010102	SAN JAVIERITO.....	669	0	0%	872	0	872	B	96	4
48	703010103	CARMEN DE RUIZ UV-1...	498	0	0%	649	0	649	B	71	4
49	703010105	SAN ANTONIO.....	445	0	0%	581	0	581	B	64	4
50	703010301	SANTA ROSA DE ROCA....	754	0	0%	984	0	984	B	108	4
51	703010303	COL. GUADALUPE - SAN M	520	0	0%	678	0	678	B	75	4
52	703010307	CMD. CRUZ DE SOUZ....	442	0	0%	577	0	577	B	63	4
53	703010401	CAMPAMENTO UV-1 UV-2 U	637	12	2%	832	0	832	b	92	4
54	703010501	PISO FIRME.....	443	8	2%	579	0	579	b	64	4
55	703010503	CMD. PORVENIR - HDA. T	451	0	0%	588	0	588	b	65	4
56	703020105	CMD. SAPOCO.....	705	0	0%	921	0	921	B	101	4
57	703020108	CMD. ALTAMIRA.....	364	0	0%	475	0	475	B	43	4
58	703020113	CMD. LAS CASITAS - RCH	415	0	0%	541	0	541	B	60	4
59	703020201	SAN JUAN DE LOMERIO...	362	0	0%	472	0	472	B	42	4
60	703030106	RCHO. SAN NICOLAS - CM	368	0	0%	479	0	479	B	43	4
61	703030501	CMD. CERRITO.....	485	0	0%	633	0	633	b	70	4
62	703030504	CMD. ESPIRITU SANTO...	510	0	0%	666	0	666	b	73	4
63	703030506	CMD. SAN VICENTE.....	685	0	0%	893	0	893	b	98	4
64	703030507	7 [BUENA HORA].....	415	0	0%	541	0	541	b	60	4
		Total	9,168	20	0%	11,961	0	11,961		1,287	

Table 5-4-5 List of Selected Blocks for the Department of Santa Cruz

No.	Block Number	Block Name	Population in 1994	W.Served Population in 1994	W.Served Ratio in 1994	Estimated Population in 2000	Expected Water Served Pop.in 2000	Expected Water Unserved Pop.in 2000	Estimated Well Depth (F-GW)	Planned Water Supply Quantity (m3/day)	Stage Plan Year
704 Province ICHILO											
65	704010104	CMD. LA ARBOLEDA (CENT	670	0	0%	766	0	766	C	84	4
66	704010118	SIND. EL CARMEN.....	577	0	0%	659	0	659	C	72	4
67	704010120	SIND. RECOMPENSA I....	419	0	0%	479	0	479	C	43	4
68	704010121	CAMINO HUAYTU.....	905	141	16%	1,034	0	1,034	C	114	2
69	704020107	SAN GERMAN DE YAPACANI	824	15	2%	941	0	941	b	104	2
70	704020108	VILLA CHORE.....	425	0	0%	486	0	486	b	44	2
71	704020109	EL PALMAR UV-1, UV-2..	552	0	0%	631	0	631	b	69	2
72	704020135	SAN CARLOS - BUENA VIS	482	0	0%	551	0	551	c	61	4
73	704020146	VILLA CHORE - EL PALMA	444	0	0%	507	0	507	C	56	4
		Total	5,298	156	3%	6,054	0	6,054		647	
705 Province CHIQUITOS											
74	705010104	CMD. QUITUQUIÑA.....	433	0	0%	485	0	485	d	44	5
75	705010110	CAMPO #12.....	419	0	0%	470	0	470	c	42	3
76	705010112	CAMPO #1.....	452	0	0%	507	0	507	c	56	2
77	705010202	BUENA VISTA.....	431	0	0%	483	0	483	b	43	2
78	705020306	SIND. SINAI.....	474	0	0%	531	0	531	c	58	3
79	705020307	COL. CUPESI.....	442	0	0%	497	0	497	c	45	3
80	705020308	PUESTO PAZ.....	589	0	0%	661	0	661	c	73	2
81	705020309	PROP. EL PALMAR.....	535	0	0%	600	0	600	D	66	5
82	705020314	COL.....	451	0	0%	506	0	506	c	56	2
83	705020315	LAS PIEDRAS #1 - BELIC	464	0	0%	520	0	520	c	57	2
84	705020321	COOP. FATIMA.....	445	0	0%	500	0	500	c	45	2
85	705020322	COL. MENONITA CANADIEN	435	0	0%	487	0	487	c	44	3
86	705020323	EMPRESA EL CAMBA - HDA	437	0	0%	489	0	489	c	44	3
87	705030105	ECIA. EL TRIUNFO.....	418	30	7%	469	0	469	b	42	2
		Total	6,425	30	0%	7,205	0	7,205		715	
706 Province SARAH											
88	706010408	[PETEORO].....	1,145	286	25%	1,167	0	1,167	c	128	2
		Total	1,145	286	25%	1,167	0	1,167		128	
707 Province CORDILLERA											
89	707020504	CMD. YUQUERETI.....	398	0	0%	503	0	503	D	45	5
90	707030501	MORA.....	683	14	2%	864	12	852	E	95	5
91	707030507	CAMPO 99-100.....	398	0	0%	503	0	503	D	55	5
92	707030510	CAMPO 107-108-111-112.	394	0	0%	499	0	499	B	45	2
93	707030511	CAMPO 105-106.....	390	0	0%	494	0	494	B	44	2
94	707030512	CAMPO 60-61.....	370	0	0%	468	0	468	B	42	2
95	707030514	CAMPO 2-8.....	378	0	0%	479	0	479	B	43	2
96	707030522	CAMPO 26-31.....	434	0	0%	549	0	549	C	60	2
97	707030525	CAMPO 4-12.....	423	0	0%	536	0	536	C	59	2
98	707030526	CAMPO 19-20.....	503	0	0%	636	0	636	D	70	5
99	707030532	CAMPO 29-30.....	370	0	0%	468	0	468	D	42	5
100	707050106	CMD. PALMARITO.....	410	45	11%	518	0	518	F	47	5
101	707060103	CMD. GUINARAPE.....	390	0	0%	494	0	494	F	35	5
102	707060304	ITANAMBICUA.....	627	0	0%	793	0	793	F	71	5
103	707060405	CMD. CAPIRENDA.....	493	0	0%	625	0	625	F	56	5
104	707060418	IBAMIRAPINTA (LADO B)	426	6	1%	539	0	539	F	49	5
		Total	7,087	65	1%	8,968	12	8,956		859	
710 Province OBISPO SANTIESTEBAN											
105	710020102	CHANE EL PUENTE.....	751	110	15%	845	88	757	C	93	2
106	710020111	S.JUAN DE LOS AMARILLO	464	0	0%	522	0	522	C	57	2
107	710020112	FAJA SAN SALVADOR.....	458	0	0%	514	0	514	C	57	2
108	710030104	CHANE INDEPENDENCIA...	1,768	156	9%	1,988	62	1,926	b	219	2
109	710030105	CHANE MAGALLANES.....	689	35	5%	775	14	761	b	85	2
110	710030144	NARANJOS UNAGRO.....	843	0	0%	947	0	947	C	104	2
		Total	4,973	301	6%	5,591	164	5,427		615	
711 Province NUFLO DE CHAVEZ											
111	711010124	CMD. CANDELARIA.....	363	0	0%	485	0	485	B	44	4
112	711010301	SAN ANTONIO.....	795	14	2%	1,061	0	1,061	B	117	4
113	711010304	CMD. LA ASUNTA.....	356	0	0%	476	0	476	B	43	4
114	711010316	CMD. CRISTO REY.....	357	0	0%	477	0	477	B	43	4
115	711020112	ECIA. SAN JUAN.....	357	0	0%	477	0	477	B	43	4
116	711020113	ECIA. SAN MATIAS.....	402	90	22%	536	0	536	B	59	4
117	711020115	ECIA. PERSEVERANCIA...	368	0	0%	491	0	491	B	44	4
118	711030206	4 CAÑADAS.....	841	53	6%	1,121	0	1,121	B	123	3
119	711030209	LINARES.....	454	0	0%	606	0	606	B	67	3
120	711030221	CENTRAL ILLIMANI.....	359	0	0%	479	0	479	B	43	3
121	711030227	SAN MARTIN.....	406	0	0%	541	0	541	B	60	3
122	711030247	COL. D/NOR CAMP.50-1-3	410	0	0%	547	0	547	B	60	3
123	711030248	COL. D/NOR CAMP.52-4-6	355	0	0%	474	0	474	B	43	3
124	711030249	COL.VILL ESP.202-3-25.	463	0	0%	617	0	617	B	68	3

Table 5-4-5 List of Selected Blocks for the Department of Santa Cruz

No.	Block Number	Block Name	Population in 1994	W.Served Population in 1994	W.Served Ratio in 1994	Estimated Population in 2000	Expected Water Served Pop.in 2000	Expected Water Unserved Pop.in 2000	Estimated Well Depth (F-GW)	Planned Water Supply Quantity (m3/day)	Stage Plan Year
125	711030250	COL.VALL.ESP.201-26-27	531	0	0%	708	0	708	B	78	3
126	711030251	COL.VALL.ESP.205-4-9	368	0	0%	491	0	491	B	44	3
127	711030254	COL.VALL.ESP.206-7-8	368	0	0%	491	0	491	B	44	3
128	711030256	SIND. PUERTO RICO	394	0	0%	525	0	525	B	58	3
129	711030258	SIND. LOS OLIVOS	369	0	0%	492	0	492	B	44	3
130	711030261	COL.NUEVA HOLANDA	569	0	0%	759	0	759	B	83	3
131	711030263	ECIA. CAMBERRA	478	0	0%	636	0	636	B	70	3
132	711030265	CMD. VILLA PRIMAVERA	406	0	0%	541	0	541	B	60	3
133	711030268	SIND. 2 DE AGOSTO	353	0	0%	472	0	472	B	42	3
134	711030270	ECIA. SAN MARTIN	546	0	0%	728	0	728	B	80	3
135	711030272	SIND. EL PORVENIR	592	0	0%	790	0	790	B	87	3
136	711030274	SIND. NUEVO AMANECER	626	0	0%	837	0	837	B	92	3
137	711030275	CMD. SAN JOSE	352	0	0%	471	0	471	B	42	3
138	711030287	SIND. MIRAFLORES	427	0	0%	570	0	570	B	63	3
139	711030298	NUCLEO 14 NUEVA VIDA	376	0	0%	502	0	502	B	55	3
140	7110302A2	CRUCE CASARABE	589	0	0%	786	0	786	B	86	3
141	7110302B1	SIND. AREA-5	673	0	0%	898	0	898	B	99	3
142	7110302B8	ECIA. LOS TRONCOS-EL C	463	0	0%	617	0	617	B	68	3
		Total	14,766	157	1%	19,702	0	19,702		2,052	
712 Province ANGEL SANDOVAL											
143	712010201	STO. CORAZON UV-1	648	18	3%	745	14	731	B	82	4
144	712010301	ASENCION	877	60	7%	1,009	0	1,009	b	111	4
		Total	1,525	78	5%	1,754	14	1,740		193	
713 Province MANUEL MARIA CABALLERO											
145	713010501	SAN JOSE DE LA CAPILLA	424	23	5%	469	0	469	D	33	5
146	713010502	PULQUINA	550	18	3%	642	0	642	D	58	5
147	713010601	SAN ISIDRO	1,183	26	2%	1,311	0	1,311	C	118	4
148	713010605	LA PALIZADA	427	89	21%	472	0	472	C	33	4
149	713010606	RCHO. SAGUINTAL	483	4	1%	535	0	535	C	48	4
		Total	3,097	160	5%	3,429	0	3,429		290	
715 Province GUARAYOS											
150	715010101	ASCENCION	8,350	1,798	22%	11,139	1,798	9,341	B	2,228	2
151	715010104	CAMPAMENTO CERRO CHICO	539	0	0%	719	0	719	B	79	2
152	715020101	URUBICHA	2,586	691	27%	3,450	691	2,759	A	414	2
153	715020102	YAGUARU	1,555	6	0%	2,074	0	2,074	A	249	2
154	715030101	EL PUENTE	1,105	129	12%	1,474	106	1,368	B	162	2
155	715030102	YOTAU	810	5	1%	1,080	0	1,080	B	119	2
		Total	14,945	2,629	18%	19,936	2,595	17,341		3,251	
		Grand Total	88,637	4,472	5%	115,181	2,785	112,396		13,185	

Figure 5-4-1 Locations of Selected Blocks for the Department of Chuquisaca

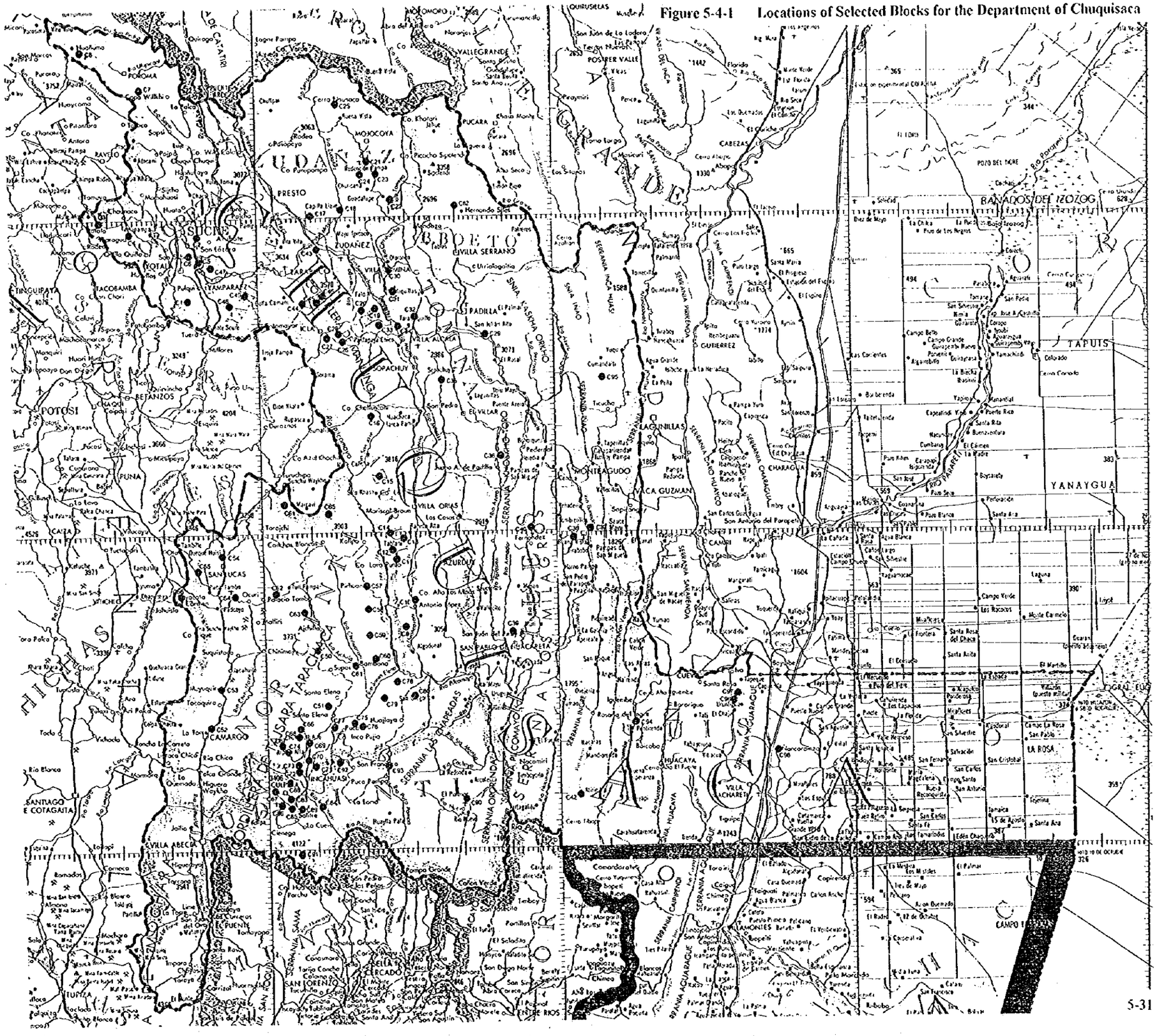


Figure 5-4-2 Locations of Selected Blocks for the Southern Part of La Paz

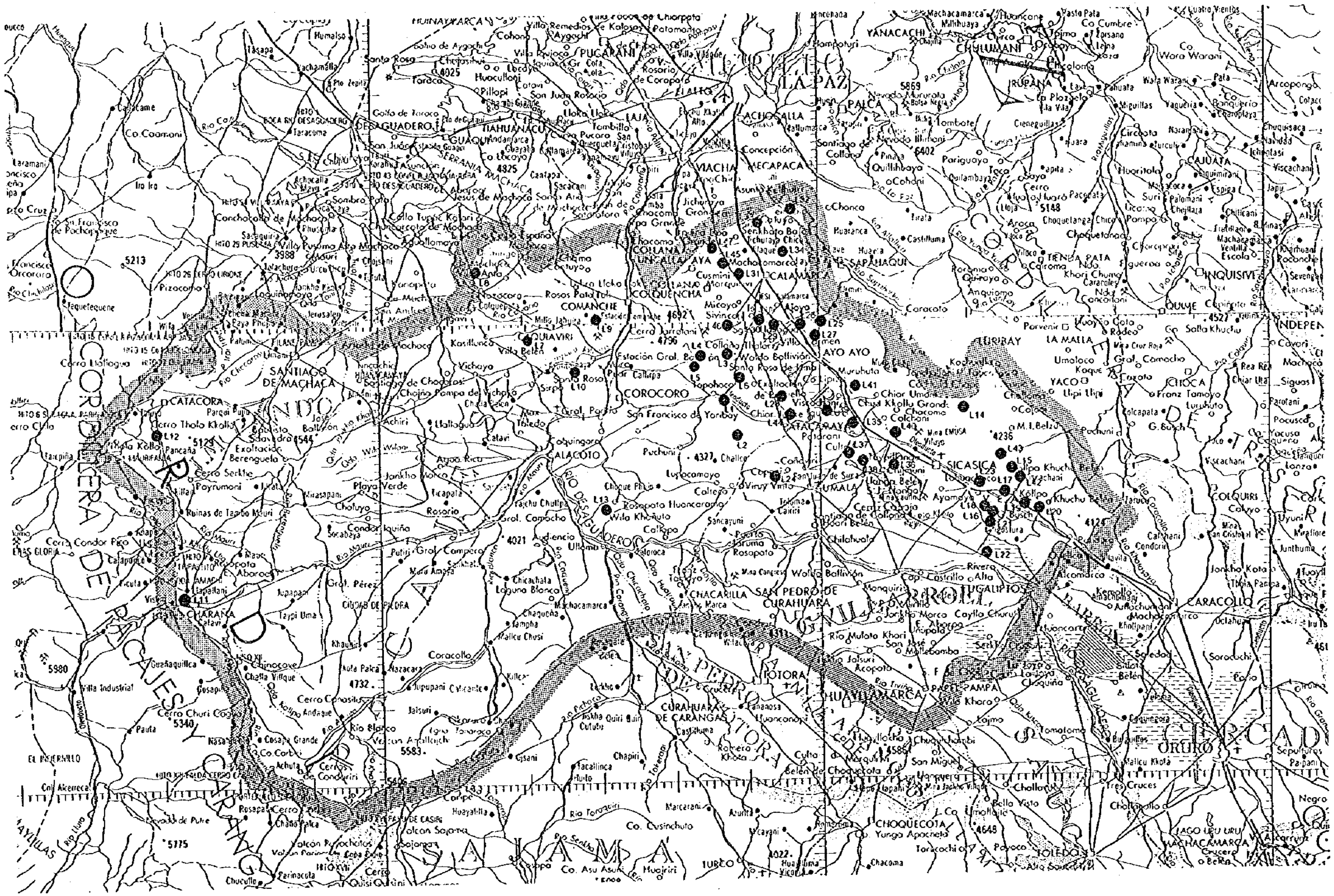


Figure 5-4-3 Locations of Selected Blocks for the Department of Oruro

Figure 5-4-4 Locations of Selected Blocks for the Department of Tarija

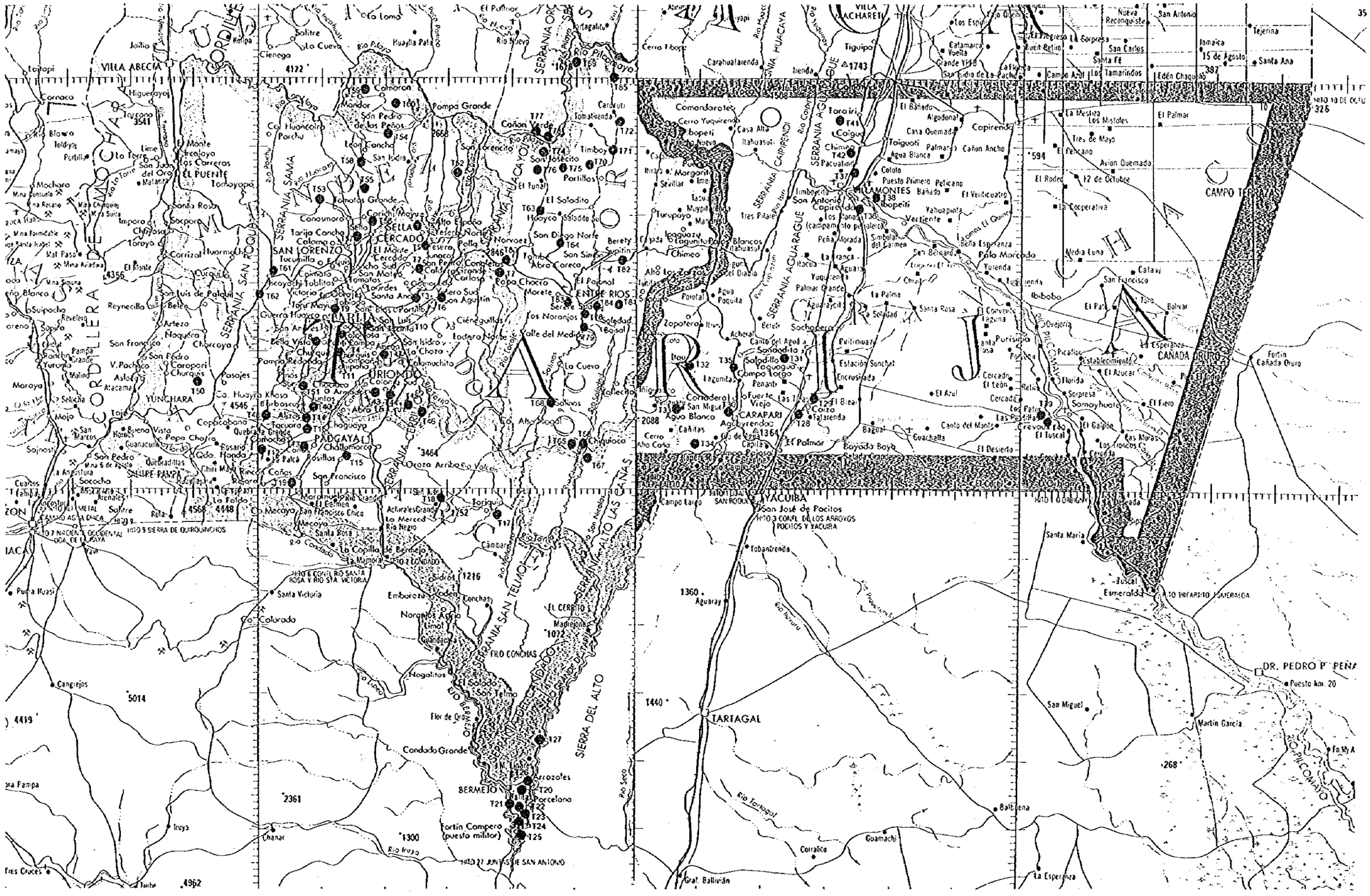
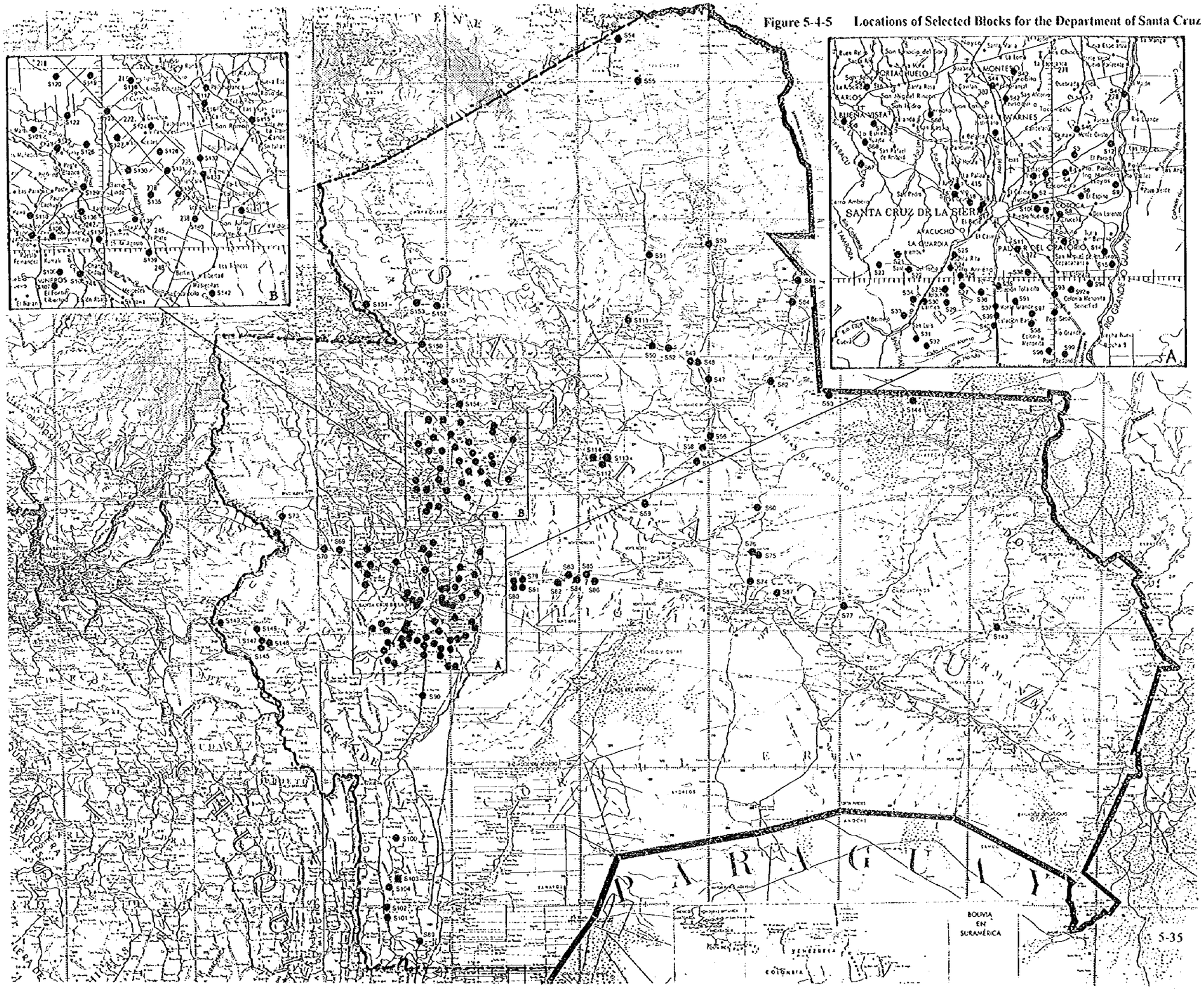


Figure 5-4-5 Locations of Selected Blocks for the Department of Santa Cruz



The targeted populations and the number and extent of the wells drilled are summarized according to Department in Table 5-4-6.

Table 5-4-6 Outline of the Proposed Project

Department	Number of Blocks	Target Population	Number of Wells	Total Drilling Depth (m)	Distribution of Drilling Depths (m)					
					0~50	~100	~150	~200	~300	>=300
Chuquisaca	98	57,295	98	11,600	38	14	34	7	2	3
South of La Paz	46	19,957	46	5,450	17		20	9		
Oruro	72	31,009	73	10,400	3	25	35	5	5	
Tarija	85	35,128	85	12,750		40	27	7	11	
Santa Cruz	155	112,396	158	20,650	4	95	39	14	1	5
Total	456	255,785	460	60,850	62	174	155	42	19	8

5.4.2 Form of Project

As a result of the hydrogeological survey, it has been judged that the development potential for deep groundwater is high in the Study Area.

Also, the results of the project implementation case study show that although the promotion of groundwater development is difficult given the current organizational system and financial conditions of Bolivia, groundwater development in rural areas will be feasible if international cooperation is provided in an effective manner under clear governmental policies.

Since the Bolivian government is judged to have the willingness and ability to promote the groundwater development project, the form of project is proposed in which the Bolivian side will carry out the well drilling work and the water supply facility work. In order to realize the procurement of drilling equipment, it is considered that, in addition to financial cooperation, education and training on groundwater prospecting techniques and drilling techniques must be provided to Bolivian engineers over a period of half a year to a year.

The proposed project is one which will provided the government agencies of Bolivia with the ability to resolve the problems of regional water supply improvement on their own and one by which long-term effects can be anticipated.

5.4.3 Implementation Organization

There are two aspects to the groundwater development project, the "public aspect," under which the project is put into operation from the standpoint of the essential objective of public welfare, and the "commercial aspect," for which the manifestation of economy is the fundamental principle. The groundwater development project must be put into operation upon balancing these two aspects.

With regard to the executing organization for the well drilling work, it is necessary for a public agency to provide direct management because of the difficulty of recovering project costs and because private enterprises are underdeveloped and low in skill level. It is proposed that the Department is most suited for this purpose since the Department is positioned among the various relevant organizations of Bolivia to be the planning and execution agency for public investment in regional areas and has the best grasp on the circumstances and hydrogeological information of the water supply blocks in the regional areas. The basic sanitation department of each Department (UNASBA) has maintained a constant level of experience and skill related to well drilling work and water supply work since the days of the former CORDES and it is judged that UNASBA can establish reliability as an executing agency for the operation and control of the project and the operation and maintenance of equipment and materials through organizational, financial, and technical fortification, and cooperation and adjustment with the central government.

The mutual utilization of drilling equipment and materials among several Departments is considered to be difficult because the required project burden is immense for each Department and because of the geographical conditions and circumstances of roads in Bolivia.

5.4.4 Required Number of Equipment and Project Cost

The numbers of well drilling equipment (rigs) necessary for accomplishing the proposed project in 5 years are calculated to be 2 units each for Chuquisaca and Tarija, 1 unit each for the southern part of La Paz and Oruro, and 3 units for Santa Cruz.

Table 5-4-7 shows the calculated project cost. A total of 71.3 million dollars, of which 39.5 million dollars are external funds and 31.8 million dollars are domestic funds, are required for the five Departments.

Table 5-4-7 Estimated Project Cost

(Unit: million dollars)

Department	Investment Amount			Breakdown of Project Cost				Term of Drilling (years)	Number of Rigs
	External Funds	Domestic Funds	Total	Procure-ment of Rig	Water Supply Equip-ment	Drilling Work	Water Supply Work		
Chuquisaca	9.0	6.9	15.9	7.8	3.2	2.0	2.9	3.1	2
South of La Paz	4.5	3.0	7.5	4.1	1.4	1.0	1.0	2.9	1
Oruro	5.7	4.4	10.1	4.2	2.3	2.0	1.6	4.8	1
Tarija	9.0	5.4	14.4	7.8	2.7	2.1	1.8	3.0	2
Santa Cruz	11.3	12.1	23.4	9.6	4.9	3.3	5.6	3.6	3
Total	39.5	31.8	71.3	33.5	14.5	10.4	12.9	-	9

(Note) The rigs shall be procured and the drilling work for the 1st year shall be carried out with foreign funds. The drilling work for the next year onward shall be carried out by the Bolivian side.

5.4.5 Stage Plan of the Projects

With regard to the project execution schedule, the policy of starting the project from regions with high potential for groundwater development and good access and gradually expanding the project towards peripheral areas was taken and the annual plans were formulated upon evening out the term of drilling and project cost for each year. The year in which the project is to be executed is shown for each block in Tables 5-4-1 to 5-4-5 and Table 5-4-8 shows the number of blocks in which the project is to be executed according to Department and year.

Table 5-4-8 Stage Plan of the Project

Department		1st Year	2nd Year	3rd Year	4th Year	5th Year	Total
Chuquisaca	Number of blocks	19	28	20	20	11	98
	Beneficiary population	12,512	19,382	9,826	9,558	6,017	57,295
	Number of wells drilled	19	28	20	20	11	98
	Total drilling depth (m)	1,300	2,050	2,300	3,000	2,950	11,600
South of La Paz	Number of blocks	7	14	9	9	7	46
	Beneficiary population	4,006	6,848	3,480	3,680	1,943	19,957
	Number of wells drilled	7	14	9	9	7	46
	Total drilling depth (m)	450	1,000	1,350	1,450	1,200	5,450
Oruro	Number of blocks	16	19	16	13	8	72
	Beneficiary population	9,990	8,417	7,008	3,511	2,083	31,009
	Number of wells drilled	17	19	16	13	8	73
	Total drilling depth (m)	1,950	1,900	2,400	2,050	2,100	10,400
Tarija	Number of blocks	14	19	21	16	15	85
	Beneficiary population	7,213	9,334	7,322	5,718	5,541	35,128
	Number of wells drilled	14	19	21	16	15	85
	Total drilling depth (m)	1,550	2,600	2,450	2,900	3,250	12,750
Santa Cruz	Number of blocks	20	36	40	39	20	155
	Beneficiary population	13,510	36,933	24,273	24,907	12,773	112,396
	Number of wells drilled	20	39	40	39	20	158
	Total drilling depth (m)	2,100	4,350	4,600	4,500	5,100	20,650
Total	Number of blocks	76	116	106	97	61	456
	Beneficiary population	47,231	80,914	51,909	47,374	28,357	255,785
	Number of wells drilled	77	119	106	97	61	460
	Total drilling depth (m)	73,500	11,900	13,100	13,900	14,600	60,850

CHAPTER 6

PILOT PROJECT

CHAPTER 6

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6.1 Outline of the Pilot Project Communities

6.1.1 General

In the pilot project, studies on the water source development potential were conducted in 4 water supply block communities by constructing test water supply systems and conducting experiments on water supply system operation and maintenance education and sanitation education.

The communities subjected to the pilot project were Campo Leon in the Department of Chuquisaca, Corque in the Department of Oruro, La Chosa in the Department of Tarija, and San Carlos in the Department of Santa Cruz. Table 6-1-1 shows an outline of the communities based on field studies and questionnaire surveys.

Campo Leon, in the Department of Chuquisaca, is a typical dispersed type rural community located in the central part of the Plain of Chaco and has a population of 237 that comprise 44 households. Most of the inhabitants are engaged in livestock farming. Due to the hot, dry climate, there is a significant shortage of water throughout the year and all inhabitants, as well as the livestock, depend on water from irrigation ponds or rainwater.

Corque, in the Department of Oruro, is a rural community with a population of 1,558 persons and 364 households located in the central part of the Altiplano, 75 km southwest of Oruro City. A highly concentrated community is formed on the slope of a hill. This community has a water distribution network that uses a spring 15 km away to the north as the water source and the current water supply coverage is 86%. However, the water source dries up in the dry season and domestic water tends to be in shortage due to restriction or interruption of the water supply.

La Chosa, in the Department of Tarija, is a rural community with a population of 371 and 85 households located 20 km southeast of Tarija City. The community is formed on a slope between the Pan American Highway and Tarija River. Whereas 42% of the inhabitants use water from a hand-dug well supplied by means of a hand pump, etc., the rest of the inhabitants collect river water downstream. Although a water supply system diverted from the nearby community of San Isidro was scheduled to be constructed, since the quantity of water taken in from the water source was low, the diversion could not be provided and part of the distribution tanks and distribution piping that were constructed have become unusable.

San Carlos, in the Department of Santa Cruz, is a rural community with a population of 480 and 106 households located 25 km southwest of Santa Cruz City. A long community is formed along a road. This community does not have a water supply system and the inhabitants obtain domestic water either by collecting water from an irrigation pond or by collecting rainwater.

Table 6-1-1 Outline of the Pilot Project Communities

Item	Campo Leon	Corque	La Chosa	San Carlos
Number of houses (excluding vacant houses)	41	322	76	100
Number of households	44	364	85	106
Total population	237	1,558	371	480
Average number of persons per household	5.4	4.3	4.4	4.5
Proportion of population below the age of 15	43.7%	34.9%	23.5%	45.6%
Illiteracy of persons of age 15 and above	9.0%	9.8%	22.6%	14.6%
Proportion of workers by occupation (Male; age 15 and above)				
a) Agriculture	6.5%	22.3%	83.9%	77.1%
b) Livestock farming	55.7	8.1	0.0	0.8
c) Mining · construction	19.7	24.6	8.9	16.7
f) Commerce	0.0	13.5	0.0	0.8
e) Service · salary earners	6.6	30.5	6.3	2.3
g) Unemployed, etc.	11.5	1.0	0.9	2.3
Employment rate of women of age 15 and above	21.1%	38.0%	14.8%	17.7%
Language used at home				
a) Spanish only	90.2%	8.8%	100%	79.0%
b) Spanish and another language	—	82.2	—	20.0
b) Another language only	9.8 (Guarani)	9.0 (Aymara/ Quechua)	—	1.0 (Quechua)
Source of domestic water				
a) Water service	—	85.9%	—	—
b) Well	—	2.8	41.5%	3.0%
c) River	—	—	49.6	—
d) Irrigation pond	100%	—	—	69.0
f) Others	—	11.3	8.9	25.0
Monthly household income				
a) Less than 100 Bs	9.1%	14.4%	11.8%	60.0%
b) 100-200 Bs	48.2	23.8	30.9	15.0
c) 200-500 Bs	36.4	54.7	35.3	16.0
d) 500 Bs or more	6.1	7.1	22.1	9.0

6.1.2 Socio-economical Situation and Sanitary Conditions

After receiving the response to the questionnaire about the captioned aspects, analysis was made and the results were tabulated according to a scheme prepared by JST and discussed in the meeting with counterparts sociologist.

A quick analysis of the summary of the almost of the questionnaire leads to the following conclusions regarding the formulation of sanitary education program and at the same time to know certain aspects which should be considered in the sustainability of water supply system.

- In the Bolivian rural areas, almost all the dwellings are uni-family, which means that the number of home connection for drinking water coincides with the number of family.
- The average number of persons per family is 4.5 approximately.
- The population composition is approximately 50/50 for men and women. However, the composition of leadership is mostly men.
- With respect to the composition by age, approximately 30% of the population is less than 15 years old.
- More than 90% of the population of school age(6 to 15 years old)are studying which makes easy the work of sanitary education.
- This work also is made easy because the illiteracy rate of those older than 15 years is less than 20%.
- Another big support for forming Water Committee is that 10% of the population older than 15 years have superior education.
- Almost all adult women have occupation in the house.
- More than 90% of the population speak Spanish, making it unnecessary to in other languages.
- Even though there are no reliable statistic information, sickness of diarrhea and of water origin are what affect more the rural communities.
- Actual water supply of bacteriological water quality is very low, like 5 to 15 liters/day/inhabitant, making prior the provision of drinking water systems a priority.
- In the Altiplano zone, it would be necessary to change of behavior to attain advances in hygienic habits once drinking water services are obtained. In the tropical zone, rapid advance of personal hygiene could be attained since the only thing missing is the supply of drinking water.
- The sanitary disposition of excrete does not exist. Therefore, as urgent complement of drinking water supply, the projects of sewerage and/or sanitary facilities should be prioritized, of which finance is feasible through Popular Participation.
- The family income have been under-valued, probably not including the foods which are consumed by family and produced by themselves.
- The major part of the drinking water services with groundwater from be auto-sustainable through the payment of tariffs if the community are educated and instructed clearly about what the operation, maintenance and administration costs signify and that the payment of

tariffs are indispensable. In some special cases, specific financial solutions should be looked for.

6.2 Construction of Pilot Project Facilities

6.2.1 Outline of Construction Works

In order to carry out education on the operation and maintenance of water supply systems and sanitation education and to make effective use of test wells, lift pumps and other water supply equipment were experimentally installed in the 4 pilot project communities, one in each of the Departments except for the Department of La Paz.

Among the test equipment, the lift pump and electric generator were purchased and sent from Japan. The installation of the lift pump and electric generator, the construction of the generator room and water tank, and the piping work were commissioned to and carried out by local construction firms.

In the construction of the test facilities, the outline of the test facilities, the construction schedule, the methods of inhabitant education, etc. were explained and cooperation was requested of the counterparts of the former CORDES of each Department and the inhabitants of each community. Guidance was also provided on the organization of a water cooperative for carrying out the operation, maintenance, and management of the test facilities.

After the completion of the facilities, trial runs were performed and the facilities were handed over to each Department upon providing education on facility operation and other operation and maintenance methods to the engineers of each Department and the inhabitants.

The installation work for the pilot system was proceeded in the following manner.

(1) Preliminary Meeting - Initial discussions were organized between the study team and the community people of pilot project sites. During these meetings, the study teams cleared the following points to the local residents.

- Outline of the pilot facilities
- Requirement for the organization of management by committee the water users. This is required for the operation, maintenance and management of the pilot equipment.
- Allocation of the civil construction work to the Water Committee (residents) and of the tasks of operating, maintaining and managing the facilities.
- The financial share to be borne by the water users

(2) Second Meeting - The study team had the residents give their writing agreement for acceptance of the installation of the pilot facilities at this Meeting.

(3) Construction of the pilot facilities by local contractors on order of the Study Team.

(4) Startup and trial operation of the facility.

(5) Handing over of the equipment.

6.2.2 Outline of the Pilot Project Facilities

With the exception of Corque, the test facilities were those for a simple water supply system of level II (public faucet system). Table 6-2-1 shows an outline of the facilities. As test facilities, a submersible motor pump was installed in the test well, a water tank and a generator room were constructed nearby, and public faucets were installed. A diesel engine generator was used as the power source for the pump.

Table 6-2-1 Outline of the Pilot Project Facilities

Point	JC-6	JC-2	JC-8	JC-4
Department	Chuquisaca	Oruro	Tarija	Santa Cruz
Community	Campo Leon	Corque	La Chosa	San Carlos
Water Pump				
Diameter	50mm	40mm	32mm	32mm
Pump discharge	17 l/min.	100 l/min.	33 l/min.	83 l/min.
Pump head	350 m	50 m	50 m	150 m
Power	11 kW	1.5 kW	0.75 kW	3.7 kW
Generator				
Model	Diesel engine	Diesel engine	Diesel engine	Diesel engine
Output	35kVA	10kVA	10kVA	15kVA
Water tank				
Structure	Reinforced concrete	—	Reinforced concrete	Reinforced concrete
Capacity	3 m^3	--	8 m^3	15 m^3
Generator house				
Structure	Reinforced concrete	Reinforced concrete	Reinforced concrete	Reinforced concrete
Area	15 m^2	15 m^2	15 m^2	15 m^2
Piping				
Material	PVC	PVC	PVC	PVC
Diameter	1 inches	4 inches	3 inches	3 inches
Length	100 m	1,000 m	100 m	100 m
Public faucet				
Number of locations	1 set	—	3 sets	1 set
Structure	Reinforced concrete	—	Reinforced concrete	Reinforced concrete
Number of faucets	4 faucets	—	12 faucets	6 faucets

In the case of Corque (Department of Oruro), since the community was approximately 1 km away from the test well, a waterpipe was laid to the existing distribution tank (capacity: approx. 50 cubic meters) in view of future water source utilization. A water tank and a public faucet were not provided. Also, in the case of La Chosa (Department of Tarija), since the test well was artesian, the lift pump was installed in a newly erected water tank and used for pumping water to the existing distributing tank (approx. 20 cubic meters).

1) Campo Leon Water Supply System

This is a simple Level II type supply system.

The equipment consists of a submerged motor pump installed in the test well, one new water tank, one existing tank, and an engine generator to supply power (installed in the engine house).

Figures 6-2-1 shows the flow sheet of this water supply system.

2) Corque Water Supply System

The scope of the system provided for Corque is different from that of the other three areas. Corque had not been selected initially for the pilot project site. The initially selected community Penias had been rejected by reasons due to Bolivian side and Corque was selected instead. As a result, the equipment which had already been ordered for Penias was transferred to Corque, just as it is.

Corque had already two water tanks installed in high locations, a loop type water distribution pipe system, and service connection for each household. The function of the new pilot system was therefore to supplement the existing water supply source which was already proving inadequate (providing only a quantity equivalent to a two-hour supply per day). The new well was thus connected to the existing distribution system.

The equipment provided in connection with the pilot system consisted of a submerged motor pump installed in the test well, an engine generator (installed in the engine house) and an approximately 1,100 meter long water pipeline.

Figures 6-2-2 shows the flow sheet of this water supply system.

3) La Chosa Water Supply System

A simple Level II type supply system was newly installed and a plans has already been established to expand this system through the efforts of the residents themselves. This plan is to link the new water source with a water distribution tank already installed on a high location to distribute water from this point to individual households.

The equipment of the pilot system consists of a submerged motor pump, a water tank and engine generator (installed in engine house).

Figures 6-2-3 shows the flow sheet of this water supply system.

4) San Carlos Water Supply System

This is a simple Level II (shared water valve) type system.

The equipment consists of a water lifting pump (submerged motor pump) installed in the test well, two water tanks (one is a new tank erected by the study team, and another is newly installed by the Water Committee), and an engine generator to supply power (installed in the engine house).

Figures 6-2-4 shows the flow sheet of this water supply system.

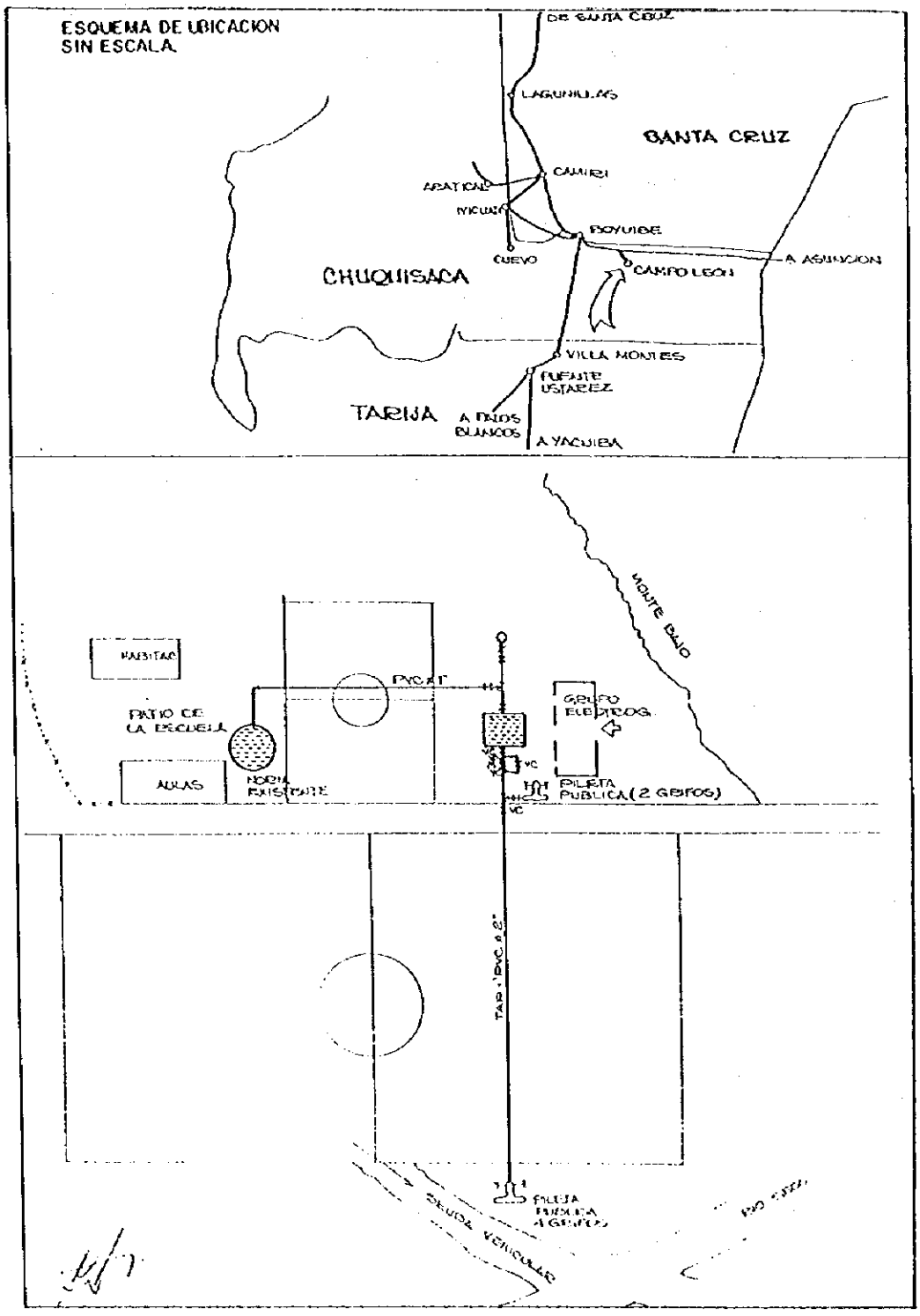

Figure 6-3-1 Flow Sheet of the Campo Leon Water Supply System

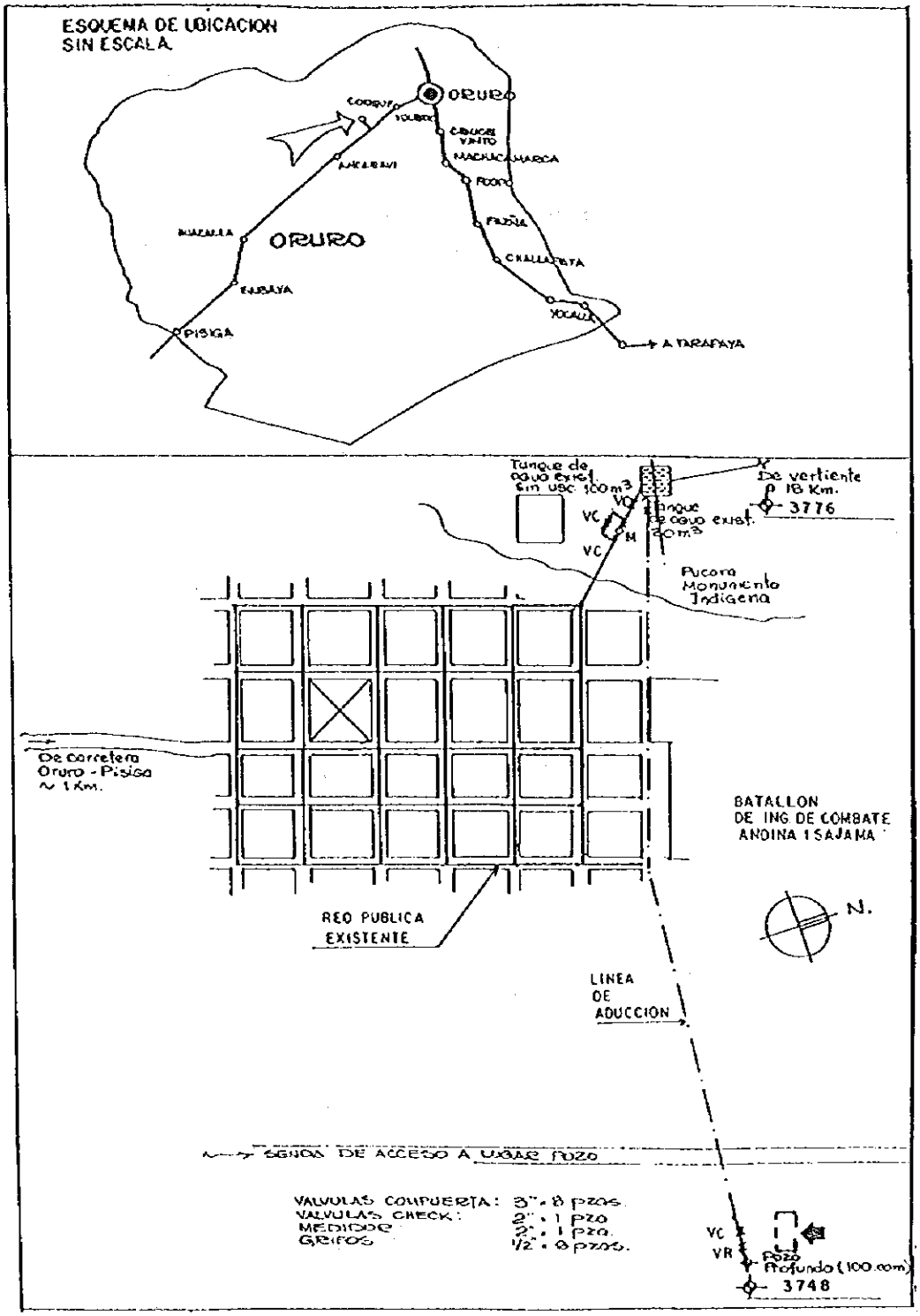

Figure 6-3-2 Flow Sheet of the Corque Water Supply System

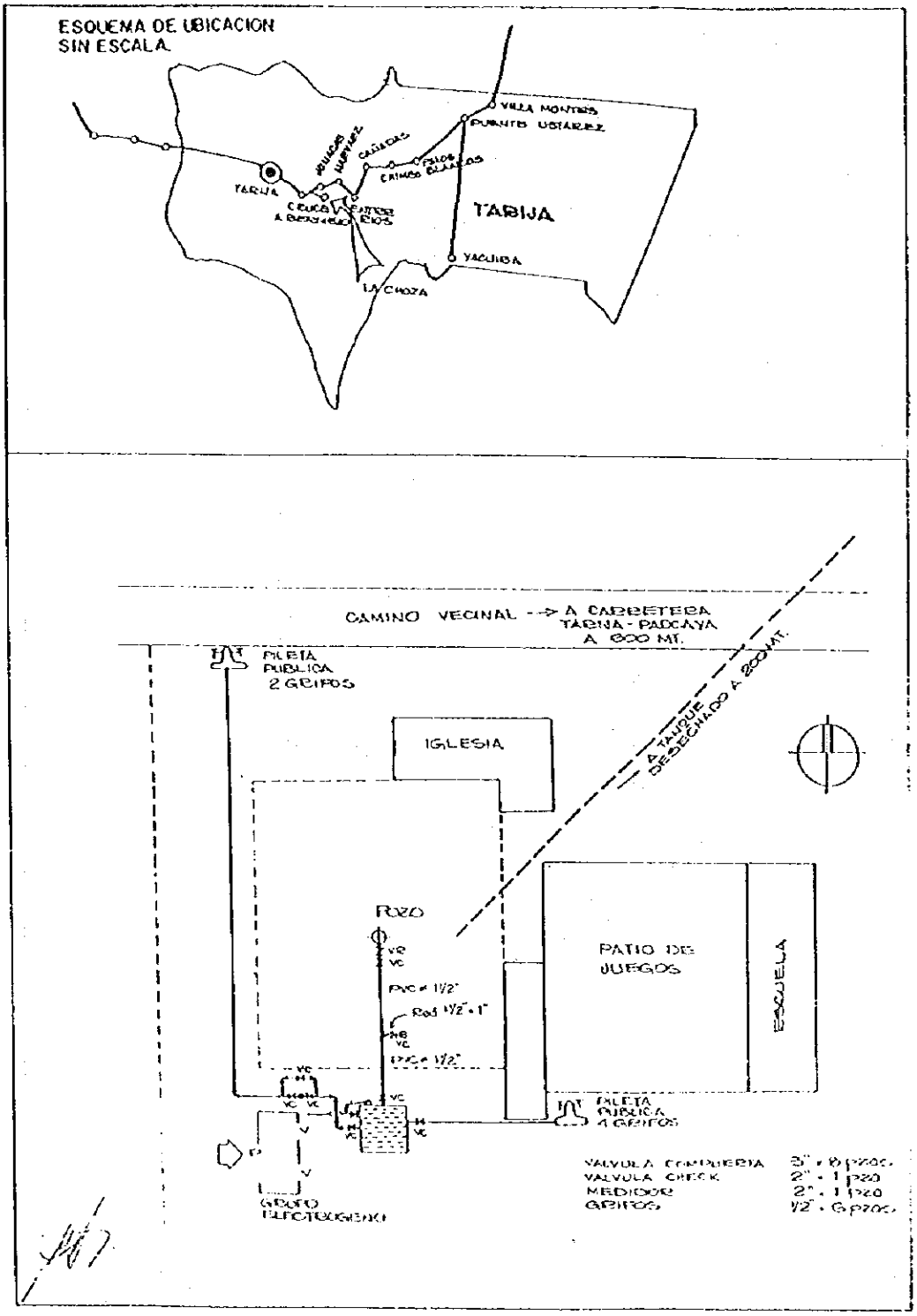

Figure 6-3-3 Flow Sheet of the La Chosa Water Supply System

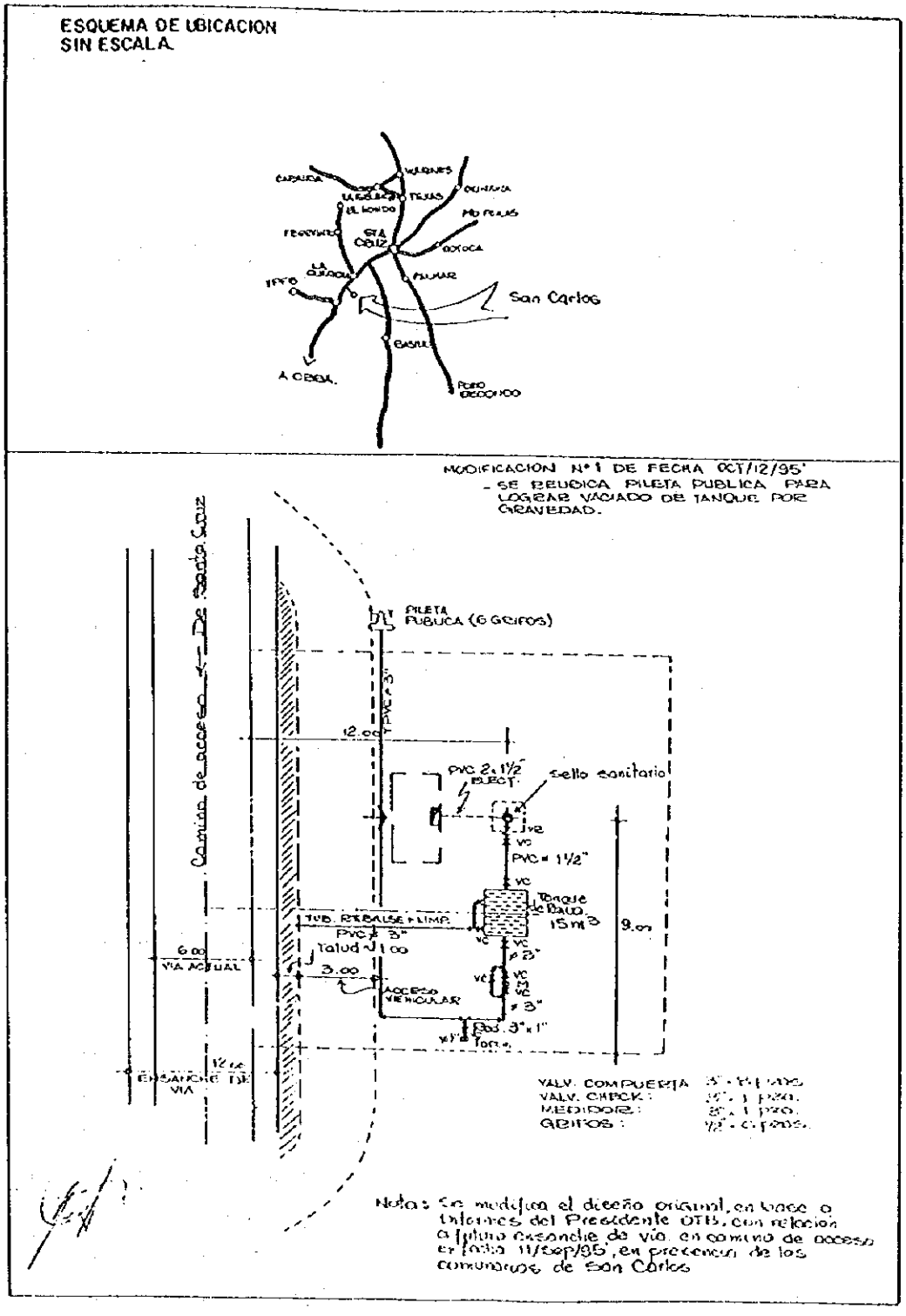

Figure 6-3-4 Flow Sheet of the San Carlos Water Supply System

Table 6-2-2 shows the demand for domestic water in each community, the yield limits of the test wells, and the pumping capacities of the installed pumps. The safe yield of each well exceeds the demand for water in the corresponding community and the necessary water supply quantity can be provided with one test well in each case. It can be seen that the yield is such that the water consumption requirement can be satisfied by 3 hours of pumping operation a day in Campo Leon, 13 hours of pumping operation a day in Corque, and 7 hours of operation a day in San Carlos.

Table 6-2-2 Comparison of Water Demands of Communities, Safe Yields, and Pump Capacities

Community	Campo Leon	Corque	La Chosa	San Carlos
Current population	237 persons	1,558 persons	371 persons	48 persons
Mean water consumption per head per day	90 l/person.day	70 l/person.day	70 l/person.day	90 l/person.day
Daily mean water consumption	21 m^3/day	109m^3/ day	26m^3/ day	43m^3/ day
Safe yield of well	2.25 l/ s	2.0 l/ s	7.55 l/ s	10.0 l/ s
Daily maximum yield per day	194 m^3/day	173 m^3/day	652 m^3/day	864 m^3/day
Lift pump capacity	120 l/min.	140 l/min.	—	105 l/min.
Hourly yield	7.2 m^3/hour	8.4 m^3/hour	—	6.3 m^3/hour

(Note) The mean water consumption per head per day was determined in accordance with the Water Service Facility Design Standards of Bolivia.
The lift pump capacities are corrected on the basis of the installation depths of the respective pumps and the pump performance curves.

6.2.3 Lessons and Problems

Several problems were found in the process of installing the test facilities. These should be of reference and taken into further consideration in the full-fledged execution of the groundwater development project. These problems are summarized below.

(1) The survey of individual communities, that was conducted in the present study, has shown that the populations of the communities differ considerably from the results of the national census of 1992. One of the reasons is considered to be the inconsistency of the national census definition of the range of a community with the actual circumstances. Community population surveys must therefore be conducted for the implementation plan.

(2) With small water supply blocks, there is also a problem in directly identifying the administrative unit of the community (town or village) as an independent water supply block. As a matter of fact, it has become clear that, for the 2 communities of San Carlos and La Chosa among the 4 communities in which test facilities were installed at this time, it is more rational in terms of a water supply system to set up a water supply block that includes several nearby communities.

(3) Information, on existing facilities, in particular, on tanks, pipes, and other equipment that have been constructed in the past as a part of a facility but have been abandoned due to the non-completion of the entire facility because of some reason or the other, have not been preserved in an organized manner and in many cases, such facilities are not discovered unless a field study is actually conducted.

In many cases, such existing facilities can be worthy of incorporating into the overall plan when planning new facilities. The collection and disclosure of such information is thus strongly desired.

(4) In all communities, the inhabitants demonstrated an extremely high demand for house-to-house faucets. However, this demand cannot be considered to be realistic in districts with a dispersed residential pattern and efforts must be made to convince the inhabitants correctly.

6.3 Workshops

6.3.1 Outline of the Workshops

Workshops on methods of formulating groundwater development plans and water supply plans and on operation and maintenance methods for water supply systems were held for the engineers of each Department in order to contribute to the improvement of the surveying skills in each Department.

1) Workshops of Groundwater Development Technology

For technical transfer, on-the-job training on geophysical prospecting methods and on test boring techniques were provided through field survey work at each of the Departments. Seminars were also held on the methods of analyzing geophysical prospecting and test boring techniques, hydrogeological investigation methods, etc.

2) Workshops on Water Supply Planning and Operation and Maintenance Technology

Workshops on water supply planning were held in the form of seminars on methods of formulating regional water supply plans and water supply system operation and maintenance methods. Slides and educational materials prepared by the Study Team were used in these seminars. Also, these seminars were not limited to general lectures on water service techniques but included explanations on practical technical topics for water supply planners and laid a stress on the characteristics of regional water supply systems and the forms of technical support for water supply system operation and maintenance for regional communities.

Also, opinions on the classification of water supply blocks, methods of selecting high priority development areas, and other fundamental topics were exchanged freely between the participants and the Study Team.

The Workshops took place from September 15 through 27, 1995 and each workshop took a full day for each CORDES.

In each Department, the participants were as follows.

Santa Cruz	13 persons
Tarija	13 persons
Chuquisaca	11 persons
Oruro	18 persons
La Paz	18 persons
Total	73 persons

3) Questionnaires

To check how the participants had understood the seminar, the Study Team distributed a questionnaire to all participants during the seminar and got their answers.

(1) What themes did you consider of the greatest interest to you ?

- Technical explanations on pumps 32%
- Regional water supply plan 13%
- Solar pump system 11%
- Groundwater quantities and pollution Minority
- Classification and use of database Minority
- Sustainability of the regional water supply project and the conditions required for this Minority
- Pump performance curves Minority
- Comparison of urban and regional water supply system Minority
- Type of water distribution pipe systems Minority

(2) What themes were new to you ?

- Solar pump system 33%
- Groundwater pollution 13%
- Water distribution pipe system 13%
- Operating schedule Minority
- Replacability Minority
- Submerged motor pump Minority
- Pump performance curves Minority
- Classification Minority
- Basic human needs Minority
- Method for preparing a water supply plan Minority
- Project evaluation method Minority

(3) Level of Understanding

- Excellent 21%
- Good 52%
- Ordinary 27%
- Poor 0%
- Very poor 0%
-

(4) Do you have manuals or documents on rural water supply plans?

- Yes, we have 30%
- No, we haven't 30%
-

(5) What do you consider most important in the execution of rural water supply plans?

- Enhancing the maintenance and management capabilities and technical competence 34%
- Management of appropriate water quantity and quality 33%
- Organization of Water Supply Committees and the participation of the water users 33%
- Education on hygiene and sanitation Minority
- Introduction of solar pump system Minority
- Economic and technical aid from foreign countries Minority
- Groundwater development Minority
- Appropriate water rates management Minority
- Use of database Minority
- Appropriate project implementation Minority

6.3.2 Lessons and Problems

(1) The number of participants in the water supply planning seminars amounted to a total of 73 persons for the 5 Departments. These participants were generally enthusiastic and some have already attained a high level of knowledge. However, there is a shortage of staff for formulating plans and providing technical support effectively in the numerous water supply blocks dispersed in each Department. More planning engineers and staff who specialize in technical support should be secured and education and training programs should be expanded.

(2) There were many participants who did not have an adequate knowledge of the natural and social characteristics of the regions targeted for regional water supplying and the actual circumstances of water supply in the individual water supply blocks. It is desired that information on the actual circumstances of water supply, etc. in each region in each Department be grasped accurately and accumulated as a common database and that such a

database be used effectively as a planning tool.

(3) Although the participants have a considerable knowledge on water supply systems per se, they do not necessarily have adequate practical knowledge on facilities, such as pumps and piping, that are the key elements of water supply systems. Since the technical support provided to inhabitants will mainly consist of discussions concerning hardware facilities, the acquisition of knowledge in this field is important.

(4) The participants do not seem to use a common manual on regional water supply but seem to use reference materials which they have obtained under individual opportunities. Since a significant number of seminars seem to be held by international agencies and support groups, it is desirable for a manual that can be used in common for the entire nation or an entire Department be prepared by organizing the materials used in such seminars.

(5) There was the impression that the participants did not have a very strong feeling of urgency regarding the system of external technical support, which is a most important function for establishing a system of operation and maintenance of the water supply system by the inhabitants. It is clear that there is a shortage of staff, in terms of both quality and number, for the regional government and public agencies to serve this function in a practical manner. It is therefore desirable for the relevant persons of public agencies to make efforts towards actively opening up a way for using private firms and consultants.

6.4 Pilot Study

6.4.1 Education on Water Supply System Operation and Maintenance

1) Outline of Operation and Maintenance Education

Water supply system operation and maintenance education was provided aiming at members of water cooperatives and inhabitants who will be involved in the operation and maintenance of system s in the future in the 4 communities subjected to the pilot project. A total of 51 persons participated from the 4 water supply blocks. Slides, operation and maintenance manuals, and pamphlets with pictures were prepared as educational materials and guidance on operation methods were provided through actual demonstrations at the site.

Period

From October 10 through 24, 1995, a full day per site

Participants

Campo Leon	11 persons
Corque	11 persons
La Chosa	14 persons
San Carlos	15 persons
Total	51 persons

2) Evaluation of Training Results

To assess the results of the training sessions, the study team used a questionnaire for participants. The answers can be summed up as follows.

(1) Level of Understanding

• Excellent	46%
• Good	37%
• Ordinary	11%
• Poor	0%
• Very poor	0%

(2) What do you think most important in the operation and maintenance of water supply facilities?

• Technical skills for handling the engine generators	48%
• Upgrading the skill of the maintenance personnel	21%
• Daily inspection	21%
• Widespread use of submerged motor pumps	Minority
• Stable supply of fuel oil	Minority

(3) What services do you feel being most needed in your area in the future?

• House to house connections and the expansion of the water supply service network	24%
• Toilets	14%
• Shower	13%
• Medical surgeries	13%

Figure 6-4-1 shows the questionnaire used for these sessions.

Favor responder al siguiente cuestionario en relación al Taller
"Dotación de Agua Potable Rural".

1.- Cuál es el tema que le interesó más a Ud?

_____
_____
_____

2.- Durante el Taller, existe algún tema que Ud. escuchó por primera vez?

Si ☐ No ☐

Si su respuesta es afirmativa, cuál es éste Tema?

_____

3.-Respecto a la comprensión de los Temas, que calificación considera pertinente?

☐ 1 Muy Buena ☐ 2 Buena ☐ 3 Normal

☐ 4 Mala ☐ 5 Pésima

4.- Ud. tiene algún (os) libro(s) sobre Control de Abastecimiento de agua en comunidades pequeñas?

Si ☐ No ☐

Si su respuesta es afirmativa. Cómo se llama ese libro y de qué país es?

_____

5.- Ud. qué considera como lo más importante en el proceso de control de abastecimiento de agua en comunidades pequeñas?

_____
_____
_____
_____
_____

Figure 6-4-1 Questionnaire Used for the Training Sessions

3) Lessons and Problems

(1) Since the starting and stopping of pumps and engines are enabled by button operation, these did not present a problem for the inhabitants. There were no problems with the monitoring of fuel oil and cooling water as well. However, it is considered that in cases of an abnormal phenomenon, such as idle running of the pump due to lowering of the water level of the well or an overcurrent or overheating accident of a pump or engine, it is nearly impossible for a inhabitant without experience to detect such phenomena immediately and take emergency measures.

(2) Although inhabitants can take emergency measures against leakage from piping or tank, the pursuing of the cause and the taking of fundamental measures are beyond the abilities of the inhabitants.

(3) Keeping the surroundings of the public water faucet clean is an extremely important daily habit and water washing and ditch clearing must be performed frequently. Although such work can be carried out by the inhabitants, it requires everyday efforts and cannot be carried out effectively without the aid of sanitation education.

(4) Although the bearing of operation costs will probably be accepted by the inhabitants without any problems, there is a strong tendency for inhabitants to cut the water supply instead of saving water in order to lower the operation costs. The problem will be serious if the water quantity required for keeping up a sanitary life is reduced and appropriate guidance is necessary.

(5) As has been described above, there are many problems which are difficult to resolve by the efforts of the inhabitants alone. External technical support is essential for the success of water supply systems and the systematic construction of channels for this purpose is desired.

6.4.2 Sanitation Education

1) Outline of Sanitation Education

The Study Team and the counterparts cooperated in performing sanitation education of the inhabitants in the 4 communities subjected to the pilot project. The total number of participants in the 5 Departments was approximately 650 and approximately half of the inhabitants participated. Videos, pamphlets (cartoons), and posters prepared in Spanish, Aymaran, and Quechuan were used as educational materials.

The education was aimed at making the inhabitants understand the dangers to health presented by the use of polluted water and the benefits of drinking water and at teaching daily habits, such as washing the hands before meals, bathing, etc., to thereby spread the recognition of the importance of water cooperatives for water supply system operation and maintenance and the paying of fees. The importance of the role of women in various stages of construction and operation and maintenance were also stressed.

2) Execution Process of Sanitation Education

(1) Meeting of Social Study Group for Sanitary Education

As the first step to prepare the sanitary education program in the communities of the pilot projects, a meeting was held among the counterparts of social studies of DINASBA, CORDES and JST on the 2nd and 3rd of August, 1995. This event took place in DINASBA in the city of La Paz with the participation of sociologists DINASBA(1), CORDECH(1), CORDEOR(1), CORDEPAZ(3), CORDECRUZ(1), CODETAR(1) and the consultant of JST(2), totally ten (10) participants.

In this meeting, the proposals and materials prepared by JST were discussed and the followings were agreed in the development of the sanitary education program in the pilot projects.

- Questionnaire in Pilot Project sites: The formulas included in the Annex were reviewed for the socio-economical questionnaire in the Pilot Project sites, instructing on the procedures to be taken in the field work as well as in the analysis and tabulation of the results.

- Principal guidelines in the process of sanitary education were proposed and discussed and agreed by the participants, to be applied in the pilot projects subject to the typical characteristics of each department.

- Materials for sanitary education

* Video: The scripts of VIDEO destined to Altiplano area and Tropical area and valley.

* Educative materials: In the meeting, ideas were discussed, exchanged and agreed regarding the preparation of poster, pamphlet, stories about the theme of drinking water and the hygienic use of water.

- Principal guidelines for involvement of women in the drinking water projects:

In the meeting, principal guidelines presented by JST were discussed and agreed.

- Chronological table: Also the activities of sanitary education program for the communities of pilot project during August to September 1995 were agreed designating responsible persons for each activity.

(2) Formation of Water Committee (CAP-Comite de Agua Potable)

The first step is to form a Water Committee with 4 to 6 members according to the size of the community.

* President
* Secretary(in charge of record)
* Treasure(in charge of tariff collection and finance)
* One to three public relations officers (Supervise administration, operation, maintenance of water service and collaborate with sanitary education of the community)

The members of the Committee offer their services to the community gratuitously without receiving remuneration. The committee should hold meetings periodically, editing records and keeping all registers and accounts to date, which should be always available to be inspected by the members of the Committee, by Sectional Municipality or Vigilance Committee. Moreover, it

is very important for the Committee to inform with it most transparency to the community about the administrative and financial management. Thus, the Committee will be respected and supported by the community.

It is indispensable for women, so tied to the distribution and the use of water to have a representation of approximately 50% of the Board of Director of the Committee.

The Water Committee in the four Pilot Project sites have been established as indicated in the Table 6-4-1

Table 6-4-1 Water Committee in the four Pilot Project sites.

Pilot Project site		Number of directive members	Number of Women	Number of Professionals
1. Campo Leon	(Chuquisaca)	6	3	2
2. Corque	(Oruro)	5	2	3
3. La Chosa	(Tarija)	7	2	1
4. San Carlos	(Santa Cruz)	5	2	1

(3) Formation of Sub-Committee of Health and Hygiene

The second step is the formation of a Sub- Committee of Health and Hygiene, which is constituted as part of the Water Committee, and assume special responsibility with respect to the education activities about health and hygiene in the construction and later stages of the water systems.

This Sub-Committee can constitute from 3 to 6 persons, according to the size of the community, selecting from the possible following list:

- A doctor, an auxiliary or promoter of health at local level within the decentralized structure of health.
- A teacher of local school belonging to respective decentralized structure of education.
- A parish priest, who is generally catholic. It would be necessary to be careful in some communities (very few) where believers of other religions can be a considerable numbers of the faithful. In this case, consideration will have to be given to the members of both churches or if the theme is conflicting, it will be necessary to desist the inclusion of followers of those churches.
- Midwife of the community.
- A woman of the Club of mothers.
- Two volunteers (man and woman) of the community.

The Sub-Committee of Health and Hygiene in the four pilot projects sites have been established shown in the Table 6.-4-2.

Table 6-4-2 The Sub-Committee of Health and Hygiene in Pilot Project sites

Pilot Project site	No. of Directive Members	No. of Women in Director	No. of Professionals in Director
1. Campo Leon (Chuquisaca)	Considering small size of the community of Campo Leon, Water Committee will be in charge.		
2. Corque (Oruro)	5	2	4
3. La Chosa (Tarija)	5	4	2
4. San Carlos (Santa Cruz)	5	4	3

(4) Orientation about sanitary education

The sociologist of CORDES instructed Water Committee and Sub-Committee about the matters which should be inculcated to the community. In the future, this function corresponds to the UNASBA of Prefectural Secretariat of Popular Participation and to Municipal UNASBA.

Those messages are:

-Water (rivers, springs, wells) can be contaminated.

-Ways which water can be contaminated.

-Difference between "water" and "drinking water".

-Sickness which contaminated water can produce.

-Advantages of having drinking water.

.Less sickness

.Less efforts in transporting water.

.More opportunity and time to do other activities and to be educated.

.Better quality of life.

-Hygiene habits:

.Keep clean latrines or hygienic services and do their necessities in the latrines.

.To wash hands with water and soap before eating and after using latrines.

.To have bath frequently to avoid sickness of skin.

.To brush teeth.

.To wash well with water the foods being consumed raw.

-Necessity of operating and maintaining the system.

.To take care of water faucets.

.To collaborate with Water Committee for operation and maintenance.

-To pay water tariffs punctually, if the drinking water system is required to keep functioning.

(5) Preparation of Educative Materials

a) Video

2 Videos have been prepared, one destined to the communities of Altiplano (Oruro and La Paz) and the other destined to the communities of tropical areas and valleys(Santa Cruz, Chuquisaca and Tarija). After presentation of Video, certain points or scenes observed in Video should be discussed with participants of the meeting provoking exchange of opinion and ideas between attendants and clarifying certain doubts if any.

b) Educative Material

Posters, triptychs and stories have been prepared, of which distribution was planned by CORDES and executed by Water Committee/Sub-Committee of Health and Hygiene. It was recommended that the material should be delivered gradually in successive meetings and not all in the first meeting. In each meeting, a determined material should be delivered to the attendants.

The triptychs (seen like a letter) were labeled and delivered to each dwelling by the members of Sub-Committee of Health and Hygiene, utilizing the chance to make a brief explanation about aspects of health and hygiene of the project.

The distribution of educative material for different entities is shown as Table 6-4-3.

Table 6-4-3 Distribution of Educative Materials

(Unit:Piece)

Address	Video Altiplano		Video Valley/Plain		Educative Material		
	VHS	BETA	VHS	BETA	Poster	Triptych	Story
1) DINASBA	3	-	1	-	100	100	100
2) CORDECH	-	-	1	1	100	100	150
3) CORDEOR	1	1	-	-	100	100	100
4) CORDECRUZ	-	-	1	-	100	100	100
5) CODETAR	-	-	1	1	100	100	150
6) CORDEPAZ	1	-	-	-	100	100	100
7) JICA	3	-	3	-	3	3	3
8) JST	2	-	2	-	20	20	20
Total	13	1	9	2	623	623	723

(6) Initial meeting with communities

In accordance with the program of Phase I, initial meetings were held regarding sanitary education with communities of 4 pilot project sites as summarized below:

a) CORQUE, ORURO:

This first meeting was held in the community of CORQUE on September 27th.

- Participants:

· Authorities: Assistant governor of Carangas province, Mayor of the Municipality of

Corque (1st section),Chief of police, Chief of basement of Army stationed in Corque.

- Members of Water Committee and Sub-Committee of Health and Hygiene. The total number of attendants are estimated to be 150.
- 2 consultants from JST, 4 professionals from CORDEOR (including counterpart, sociologist and engineer in charge of operation and maintenance) and the engineer, counterpart from DINASBA in charge of sanitary education.

- Activities realized:
  - Training and instruction to members of CAP and SSH.
  - Initiation of work of well perforation, ceremony prepared by the authorities of CORQUE.
  - Meeting with the community.
  - The time table of activities on sanitary education was accepted and subscribed to be executed till March 1996.
  - Presentation of video (two presentations due to the big number of attendants)
  - Quick evaluation about video.
- Comments:
  - The initial meeting was successful. This is mainly due to the preparatory work of promotion due by the sociologist of CORDEOR, efficient work of CAP and SSH, the total support from authorities, and the backing up from the community who are very motivated, which make sure that the objectives in sanitary education will be attained.

b) SAN CARLOS, SANTA CRUZ:

This first meeting was held in the community of San Carlos on October 2nd, 1995.

- Participants:
  - Directors of OTB in San Carlos.
  - Members of Water Committee and of Sub-Committee of health and hygiene.
  - Community and students of San Carlos, total number of attendants are estimated be 220 persons.
  - 2 consultants from JST, 2 professionals from CORDECRUZ, and counterpart engineer from DINASBA.
- Activities realized:
  - Training and instruction to members of CAP and SSH.
  - Visit to the well constructed and to the civil works in actual construction.
  - Meeting with the community.
  - Presentation of video (4 times of presentation due to the big number of attendants)
  - Quick evaluation of video.
  - The time table of sanitary education was approved and accepted to be executed till March 1996.
- Comments:
  - The initial meeting was successful. The community was very motivated and it is

required to continue the process of sanitary education to obtain its goal.

- However, it is indispensable for CORDECRUZ to intensify their presence training members of CAP and SSH of San Carlos and participating in the meetings about sanitary education which should be realized toward the community. Furthermore, it is required to have the necessary video projector to execute whenever necessary and in the different places being projected.
- Moreover, the community of San Carlos, neighboring communities and CORDECRUZ have already a project to be executed in a short period to amplify the system constructing a water tank on a hill near to the well constructed and install the distribution net for home connection to all dwellings of the three communities. This project will be financed resorting to the funds coming from the Fund of Social Investment (FIS),from the law of Popular Participation and from the sources provided by the proper community. It is estimated that only by home connection, will it be possible to collect necessary tariffs to operate and maintain water system.
- An aspect which was especially recommended to the community is relating to the punctual payment of tariffs of drinking water, since it is the only way to assure the sustainability of the service and consequently the achievements of sanitary education. A clear and understandable demonstration was made to be Water Committee and Sub-Committee of health and hygiene about which each m^3 of drinking water will be less than Bs.3, in comparison with Bs.25 which actually are paid to by doubtful quality of water.

c) LA CHOZA, TARIJA:

This first meeting was held in the community of La Chosa on October 5th, 1995.

- Participants:
  - Magistrate of La Chosa.
  - Members of Water Committee and Sub-Committee of health and hygiene of La Chosa.
  - Community and students of La Chosa. Total number is calculated to be 250 persons approximately.
  - 2 consultants from JST, 3 professionals from CODETAR, and engineer counterpart from DINASBA in charge of sanitary education.
- Activities realized:
  - Training and instruction to members of CAP and SSH.
  - Visit to the well and civil works in actual construction, and to the existing tank of $16m^3$.
  - Meeting with the community.
  - Presentation of video (4 times of presentation due to big number of attendants).
  - Quick evaluation about video.
  - The time table of sanitary education was accepted and subscribed till March 1996.
- Comments:

- The community was very motivated and desirous of completing the work totally supplying home connection to all dwellings, since this is the only possible way to collect the necessary tariffs to operate and maintain water system. For this purpose the community will conclude the tank of $16m^3$ which is constructed on a neighboring hill, in a level higher than the well. Furthermore, a distribution net is already installed, which should be reviewed and reconditioned. Moreover, the community has pipes which will facilitate the installation of home connection to all the dwellings.
- It is recommended for UNASBA/CODETAR to have the necessary video projector to show whenever necessary.
- It was also explained about the sustainability of service and payment of tariffs and about the less cost per m^3 of drinking water comparing with the cost of contaminated water which actually they consume.

d) CAMPO LEON, CHUQUISACA

This first meeting was held in the community of Campo Leon on October 11th, 1995.

- Participants:
  - Members of Water Committee (which also assume the functions of Sub-Committee of health and hygiene due to the reduced population of Campo Leon.)
  - Community and students of Campo Leon. Total number is calculated to be about 100 persons.
  - I consultant from JST, and 2 professionals from CORDECH.
- Activities realized:
  - Training and instruction to members of Water Committee.
  - Visit to the well which was being constructed in Campo Leon.
  - Meeting with the community
  - Presentation of video.
  - Quick evaluation about video.
  - The time table of sanitary education was accepted and subscribed till March 1996.
- Comments:
  - The meeting was successful, since this community, having permanent scarcity of water, is easier in a short period to settle their vital necessity of drinking water.
  - Though a well is very deep with sophisticated pumping equipment of costly operation and maintenance, it is estimated that the community will aspire to finance the sustainability of the service (fundamental to succeed in sanitary education),since they have no alternative of hydraulic resources. Anyway, it was explained that the tariff being collected per m^3 for drinking water will cost less than one fifth of what it actually cost for each m^3 of contaminated water.
  - The community is sufficiently motivated to obtain financing of the system, with the constitution of an elevated tank and the installation of distribution net for home connection.

e) CORDEPAZ

Though in the Prefecture of La Paz, there is no pilot project, it is convenient to present to the officers of UNASBA/CORDEPAZ the sanitary education program of JST, so that drinking water project may be applied in the 4 provinces of the South of La Paz. For such a purpose, a meeting was held with five officers of UNASBA/CORDEPAZ, on October 9th, 1995 to explain about the scope of the sanitary education program of JST.

In this opportunity, the following points were discussed and explained:

- Objectives and strategies of the program.
- Procedures.
- Utilization of educative material, delivering copies of video in Altiplano and of other educative materials as indicated in the respective table.
- Necessity of continuous education in the sanitary education programs to obtain changes of customary behavior.
- Necessity of having trained personnel for the sanitary education within UNASBA/ CORDEPAZ, who will in turn train the related personnel of the sanitary education within municipal UNASBA.
- Importance of technical calculation, implementation and punctual collection of water tariffs to assure the sustainability of the service and consequently to attain the goal in sanitary education.

3) Evaluation of Sanitation Education

To examine the effectiveness of the sanitation education, the questionairy surveys were conducted at each community after finishing the education program. Figure 6-4-2 shows the questionnaire format that had been used for the survey. And Table 6-4-4 indicates the summarized results of the surveys.

QUESTIONNAIRE

Community:_____Date:_____

Interviewed: Man_____Woman_____

Age: _____ _____

Occupation: _____ _____

1. Why is water said to be source of life?_____

_____

2.Why is the well water contaminated?_____

_____

3.What will happen if we drink contaminated water? _____

_____

4.What disease will be transmitted by using contaminated water?_____

_____

5.Why is drinking water said to be healthy? _____

_____

6.What advantage can be obtained when a drinking water faucet is in a house? _____

_____

7.Why do we have to wash our hands with drinking water and with soap
before consuming foods? _____

_____

8.What sanitary habits can you have if you rely on drinking water in your house? _____

_____

9.Why do we have to pay punctually the monthly tariffs of drinking water? _____

_____

10.Why do women have to participate in the water committee of your community? _____

_____

11.In general, how did you like the Video? _____

_____

13.How do you evaluate the Video : Good Regular Tiresome

12.Do you want to watch again? Yes No

13.Would you recommended those who have not seen yet Video to see Video?

Yes No

Figure 6-4-2 Questionnaire Format for Evaluation the Sanitation Education

Table 6-4-4 Evaluation of Sanitation Education

Preguntas/ Evaluacion	CORQUE			SAN CARLOS			LA CHOSA			CAMPO LEON			TOTAL		
	B	R	M	B	R	M	B	R	M	B	R	M	B	R	M
1	16 (80%	2 10 10)	2	19 (95%	1 5	0 0)	15 (75%	5 25	0 0)	16 (80%	4 20	0 0)	66 (83%	12 15	2 2)
2	12 (60% 10)	6 30	2	16 (80%	4 20	0 0)	17 (85%	3 15	0 0)	17 (85%	3 15	0 0)	62 (78%	16 20	2 2)
3	19 (95%	0 0	1 5)	20 (100%	0 0	0 0)	20 (100%	0 0	0 0)	19 (95%	1 5	0 0)	78 (98%	1 1	1 1)
4	19 (95%	0 0	1 5)	19 (95%	1 5	0 0)	20 (100%	0 0	0 0)	19 (95%	1 5	0 0)	77 (97%	2 2	1 1)
5	16 (80%	3 15	1 5)	20 (100%	0 0	0 0)	20 (100%	0 0	0 0)	17 (85%	3 15	0 0)	3 (91%	6 8	1 1)
6	19 (95%	1 5	0 0)	14 (70%	6 30	0 0)	16 (80%	4 20	0 0)	16 (80%	4 20	0 0)	65 (81%	15 19	0 0)
7	19 (95%	1 5	0 0)	20 (100%	0 0	0 0)	20 (100%	0 0	0 0)	17 (85%	3 15	0 0)	76 (95%	4 5	0 0)
8	14 (70%	6 30	0 0)	18 (90%	2 10	0 0)	18 (90%	2 10	0 0)	19 (95%	1 5	0 0)	69 (86%	11 14	0 0)
9	16 (80%	3 15	1 5)	14 (70%	6 30	0 0)	18 (90%	10 10	0 0)	20 (100%	0 0	0 0)	68 (85%	11 14	1 1)
10	13 (65%	5 25 10)	2	17 (85%	3 15	0 0)	13 (65%	7 25	0 0)	14 (70%	6 30	0 0)	57 (71%	21 26	2 3)
11	16 (80%	3 15	1 5)	19 (95%	1 5	0 0)	18 (90%	2 10	0 0)	20 (100%	0 0	0 0)	73 (91%	6 8	1 1)
12	20 (100%	0 0	0 0)	20 (100%	0 0	0 0)	20 (100%	0 0	0 0)	20 (100%	0 0	0 0)	80 (100%	0 0	0 0)
13	20 (100%	0 0	0 0)	20 (100%	0 0	0 0)	20 (100%	0 0	0 0)	20 (100%	0 0	0 0)	80 (100%	0 0	0 0)

Note: B: Understand well R: Understand Regular M: Misunderstand or do not understand

4) Conclusions on Sanitary Education

(1) The pilot projects of sanitary education were implemented in the sites of Corque, San Carlos, La Chosa and Campo Leon. It can be said that the result was a big success due to not only well prepared preparation beforehand by the part of JST, but also due to the collaboration by

the part of the persons in charge of sanitary education of DINASBA, of each CORDE, of the members of Water Committee and Sub-Committee of Health and Hygiene formed recently in each community.

(2) At all the sites, more than 100 to 200 persons attended from the community and it was necessary to show the video three or four times to satisfy the people who participated. The results of presentation of video were evaluated through the attached evaluation sheet having obtained the attached results. The results were divided into three categories:

Understand well(B), Understand fairly (R) and Misunderstand or Do not understand (M).

The majority of the inhabitants understood well the necessity and the importance of drinking water. With respect to the participation of women in Water Committee, their acceptance seems to be still low. In this sense, it will be necessary to continue to promote the participation of women in Water Committees.

(3) It is very important to change the behavior of the people in the community about hygiene habits, once drinking water systems should function. For this, it will be necessary to continue to have repeated and periodical meetings by Water Committee and Sub-Committee of Health and Hygiene under the supervision of DINASBA and CORDES, as agreed in the respective timetable which have been subscribed.

(4) The communities understood clearly the importance of relying on a sure source of ground drinking water, and they become so enthusiastic and motivated that it will be possible for them to obtain finance to complete the services with the installation of home connection.

(5) The aforementioned would serve to obtain punctual payment of water tariffs, which in turn assure the sustainability of the service and consequently to maintain the success of sanitary education. About the matter, the communities understood clearly the explanation which JST made about the lesser cost which each m^3 of drinking water in comparison with the cost of each m^3 of water of very doubtful quality which they are actually consuming.

(6) In relation with the specific objectives of sanitary education to the community, the understanding of the community is summarized as follows.

a) Benefits of drinking water: understood completely.

b) Change of behavior of hygiene:

- Easy understanding and comprehension in communities of plain areas and valleys (Santa Cruz, Tarija, Chuquisaca) due to the hot weather.
- Show understanding in the high land area (Oruro) due to the cold weather of its area. The process of education should be continued.

c) Payment of tariffs:

- More than the half of the inhabitants understood that paying tariffs, the water system can be maintained and continued.
- Acceptance of tariffs:

Easy acceptance: In communities where there are no services and the necessity of water is vital: where they buy water of poor quality at high

cost; where no tariff were paid; where the climate is hot (for example: Campo Leon, San Carlos, La Chosa)

Difficult acceptance: In communities where there were services; where there is water source nearby, though not drinkable; where they were paying a very low tariff; where very little water is used; where the climate is cold(for example, Corque).

In those cases, educational effort should be continued.

d) Involvement of women: The participation of women in the Water Committee has started slowly. It is necessary to keep promoting the participation of women.

5) Lessons and Problems

(1) Videos, pamphlets (cartoons), and posters prepared in Spanish, Aymaran, and Quechuan were used as educational materials. These materials were popular among the inhabitants as being easy to understand and it is considered that these can be used effectively in other regions as well.

(2) According to the questionnaire surveys held after the sanitation education's, most participants has understood the importance of water and the need of operation and maintenance of the system. However, the changing of the sanitation habits of inhabitants is not something that can be accomplished in a short term and sanitation education should be introduced from the water supply system planning stages and should be continued for an appropriate term after construction while checking the response of the inhabitants. Education must therefore be incorporated in the water supply plan execution schedule.

(3) Dialog between the educator and the participants is necessary in carrying out education. The cooperation of schools and priests can also be obtained to incorporate sanitation education in the school education curriculum and messages delivered after prayers.

(4) Most women works inside their houses in the rural area and water drawing works are carried mostly by women and children in the Study Area. This particular works presumably requires a large proportion of their working hours. Women have so much interests in water supply projects, so that it is effective to focus on women for the operation and maintenance training and sanitary education program. In order to formulate effective water supply planning, it is necessary to incorporate the living pattern, needs and opinion of women as end users of water.

(5) Many inhabitants in rural area desire the construction of water supply system more than other infrastructure projects and improvement of education at present. Especially they hope the implementation of groundwater development which water would not dry up even in dry season. Many inhabitants have agreed the necessity of water tariff payment and the importance of operation and maintenance.

6.4.3 Involvement of Women

1) Background

From a long time ago, women have been involved in the installation of drinking water service, however, the "involvement" of women only meant their physical contribution in the work of construction. However, in the light of changes which occurred regarding the approach of policy oriented to women in the past 50 years, the incorporation of women in projects of water supply and rural sanitation also has to be changed . Furthermore, the role of women has to be strengthened when the new concept of sustainability or continuity of those services are converted in the real goal of development.

The present project of development of ground water in rural areas realized this when the incorporation of women in the project was determined within the scope of the study.

In Bolivia, women in the rural area have always participated in the stage of construction of the projects of drinking water generally by providing hand labor and transporting material.

Now that the sustainability of the service is considered the key evaluation indicator for successful development of rural drinking water supply, it is more sensible to recommend the intervention of women by virtue of their role in the traditional activities of distribution and main user of water.

2) Actual situation of women in communities of the pilot projects.

Table 6-4-5 shows the "Base Line" at the start of the pilot projects in August 1995 in four communities.

Table 6-4-5 Base Line at the beginning of pilot project

Base Line at the beginning of pilot project				
Community	Campo Leon	Corque	San Carlos	La Chosa
1. Total Population	237	1,558	480	371
2. Women (%)	54	49	49	47
3. Women who are studying (% against total students older than 6-5 years)	59	48	52	51
4. Women illiteracy (% against total population older than 15 years)	6	8	10	17
5. Women with higher education (% against total with higher education)	50	32	71	31
6. Women older than 15 years whose occupation is in the house (% against total population older than 15 years)	33	24	41	32
7. Woman in communal organizations (% against total persons in such organizations)	33	24	5	45
8. Women in directors of CAP & SSH (% against total persons in CAP & SSH)	50	40	60	50
9. Number of women's leader in communal organizations	3	8	6	6

3) Evaluation of involvement of women

The following presents a description of indicators of evaluation about the incorporation of women in the process of rural drinking water supply in the two phases.

(1) Evaluation during the process

This evaluation should be made semiannually and annually, and includes:

- % of women the participated in events of training among total participants.
- % of women in Sub-Committee of Health and Hygiene.
- % of women in Water Committee.
- % of women in operation and maintenance.

(2) Evaluation of impact

This evaluation should be made annually after the inauguration of the service.

- % of women in committees and organizations, where they occupy decision making posts.
- Number of women considered as leaders of the community.
- % of men and women who accept the improved installations of drinking water and sanitation.
- % of men and women who know the use and practice of:

-use of latrines

-washing hands

-personal hygiene(bath, tooth, brushing etc.)

In each community, more applicable indicators should be selected in addition to other indicators.

4) Conclusions about the involvement of women:

(1) The base line at the beginning of the pilot projects shows that traditional belief of women in the rural area is still maintained. Men, including women consider that feminine gender should not be in charge of leadership within the communal organizations, including Water Committee.

(2) However, this is starting to change since approximately 50% of CAP and SSH in the pilot projects are constituted by women, though it also should be recognized that their position is still timid and passive.

(3) Accordingly, it will be necessary to continue to promote the participation of women in the management of water committees, sub-committees of health and hygiene and in the proper groups of operation and maintenance of the drinking water systems.